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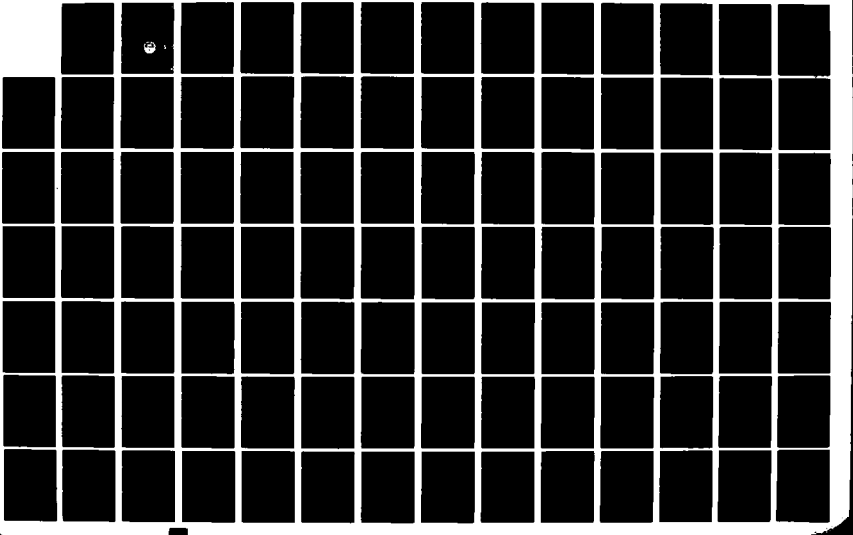

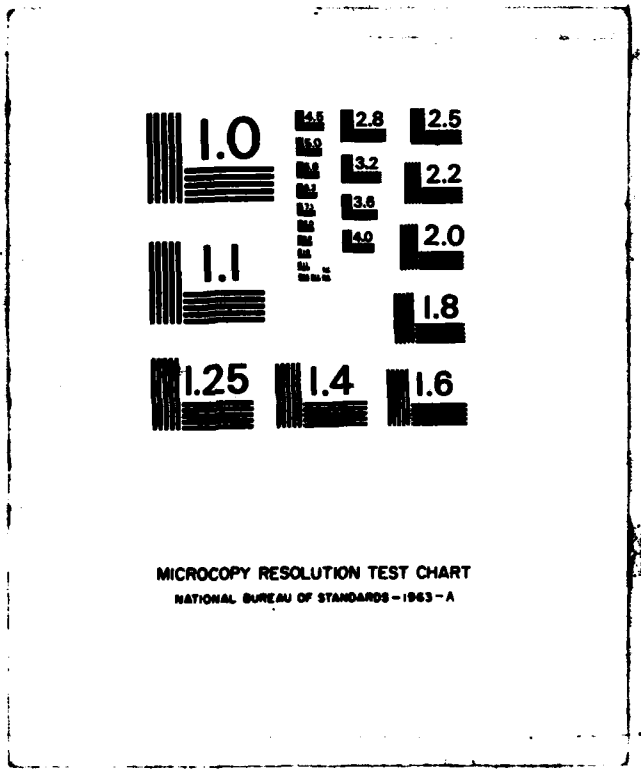
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DECEMBER 1979

TAXONOMIC APPROACHES TO ENLISTED OCCUPATIONAL CLASSIFICATION: VOLUME II

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NPRDC TR 80-7

December 1979

TAXONOMIC APPROACHES TO ENLISTED OCCUPATIONAL CLASSIFICATION: VOLUME II

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CONTENTS

APPENDIX A

ANNOTATED BIBLIOGRAPHY OF PUBLICATIONS DEALING WITH TAXONOMIC AND CLASSIFICATORY METHODOLOGY AND SYSTEMS

Beers, R. J., Fisher, J., Megraw, S., & Lockhart, W. R. A comparison of methods for computer taxonomy. The Journal of General Microbiology, 1962, 28, 641-652.

A number of modifications in computer techniques for the analysis of taxonomic data according to the general principles propounded by Sneath were suggested by Beers and Lockhart. This paper reports the results of some comparisons of the various proposed methodologies.

The systematic relationships among 54 strains of bacteria, representing principally the genera *Achromobacter*, *Aerobacter*, *Alcaligenes*, *Escherichia*, *Mima*, *Pseudomonas*, *Serratia*, and *Streptococcus*, were examined by computer methods. Seventy-one properties of these organisms were determined, and the resulting data scored in different ways (according to various proposed techniques) before being submitted to an appropriate computer program for calculation of similarity (S) values. These comparative studies indicated that better division of organisms into mutually similar groups can be achieved when data about properties which may have several alternative expressions are handled in the manner proposed by Beers and Lockhart. The number of comparisons which contribute to individual similarity values should be held constant by adequate treatment of quantitative data and by adoption of scoring methods which permit comparisons between 'negative' properties. Although the calculation of S was always the same, use of different scoring conventions assured that in some cases properties 'negative' for both organisms contributed to the value of the calculation.

It may be useful to employ distance ($D = \log_2 1/S$) rather than similarity as the primary measure of relationships among groups of organisms. Intervals on a similarity scale are different from those on the logarithmic D scale. Delineation of groups on this basis would perhaps be more valid than the use of similarity values.

Beers, R. J., & Lockhart, W. R. Experimental methods in computer taxonomy. The Journal of General Microbiology, 1962, 28, 633-640.

In the preparation of taxonomic data for computer analysis, some new methods are proposed in this paper which compensate for certain inadequacies in present techniques without violating the essential Adansonian axiom that all properties of organisms are of equal significance in the creation of taxa. A modified scoring technique is presented for use with tests wherein two or more alternative responses (none necessarily negative) are possible. The proposed method might well be extended to the scoring of all data. One is never sure of the significance of a 'negative' result, and it could be considered that at least two alternatives of equal value in classification may exist for any determinable property of an organism.

It is suggested that computer relationships among organisms might better be expressed in terms of *distance*, which is a logarithmic function of the *similarity* ratio in current use. A new diagnostic parameter, P, is defined as a quantitative estimate of the proportion of organisms in any group (taxon) which possess a given property. Computer programs based on such values could be devised for diagnosis of organisms whose identity is unknown.

Bergum, B. O. A taxonomic analysis of continuous performance. Perceptual and Motor Skills, 1966, 23, 47-54.

Psychologists have been aware for some time of the general relationship between degree of motivation and performance level as measured in a variety of ways and under different circumstances. In the area of vigilance, the notion of activation level has been suggested as an explanatory concept for the characteristic declines in performance. It is the author's stated purpose of this paper to suggest how an extension of the activation level concept might prove fruitful for integrating the general area of continuous performance, from classical vigilance through productive repetitive tasks, within a single conceptual framework.

The author then develops a taxonomy of performance tasks through an analysis of each of the major components of any given task in terms of its stimulus contribution to the CNS, and by associating the resulting overall levels of stimulation with specific characteristics of performance. A summary of this paradigm is presented in matrix form wherein source of stimulus and degree of stimulation constitute the rows and columns of the matrix. Three general sources of stimulation are considered: relevant, mediation, and reaction. Degree of stimulation is presented on a continuum ranging from low, through moderate, to high.

Using this paradigm as a general model, the author develops a matrix of task characteristics for relating tasks in terms of their total stimulation value and for predicting the effects of experimental variables on the performance associated with these tasks, based on the premise that specific characteristic aberrations in performance are associated with specific extreme deviations in activation level.

Berman, M. L. Instructions and behavior change: A taxonomy. Exceptional Children, 1973, 39, 644-650.

A brief review is presented of the current heavy emphasis on the management of consequent events (i.e., those occurring after behavior), as opposed to the relative disinterest in antecedent events (i.e., those occurring prior to behavior). The author suggests that a field should be developed which is devoted to the investigation of antecedent events and which would be as precise and thorough as research focused on consequent events.

With the need for greater investigation of antecedent events, particularly instructions, a taxonomy of instructions is presented, including as main categories (1) characteristics of instruction, (2) characteristics of the instructor, (3) characteristics of the instructees, and (4) factors related to the effects of instructions on instructees.

Characteristics of instructions are broken down into quantitative, qualitative, and intentional aspects. The primary quantitative aspects of instructions are considered to be frequency, duration, and the number of different instructions given simultaneously. The primary qualitative aspects of instructions include amplitude, grammar, vocabulary, complexity, and

explicitness. Six intentional aspects are proposed covering the many purposes for which instructions are given and in relation to a great range of behaviors.

Under characteristics of the instructor, three modes of presentation of instructions are given, along with their particular strengths and weaknesses. The three modes are human, machine, and text. The choice of an instruction presentation mode will depend on the quantity, quality, and intent of the instructions involved.

With regard to instructees, the characteristics of the persons to whom an instruction is presented are important determinants of the effects of instructions. Among the characteristics which may be considered are the following: age, sex, educational background, cultural background, interests and hobbies, academic preferences, vocational preferences, grade level, scores on relevant standardized tests, history of relationship to instructor, the number of instructees involved in receiving the instruction, the relationship of instructees to each other, and instructees' social and emotional maturity.

A number of factors are related to the effects of instructions on instructees. Some of these factors are discussed, namely, the consequences of instructions, availability of alternative or competitive behaviors, physical environment, state of deprivation or satiation of the instructees, and history of relationship to the instructor.

Bloom, B. S. (Ed.). Taxonomy of educational objectives. The classification of educational goals. Handbook I: Cognitive domain. New York: Longmans, Green and Co., Inc., 1956.

This Handbook is a group product, being the direct outgrowth of the thinking of over 30 individuals. Original plans called for a complete taxonomy of educational objectives in three major parts---the cognitive, the affective, and the psychomotor domains. The cognitive domain, which is the concern of this Handbook, includes those objectives which deal with the recall or recognition of knowledge and the development of intellectual abilities and skills.

Part I of the Handbook is intended to develop some insight into the principles of development and organization of the taxonomy, to develop an understanding of the nature and significance of the cognitive domain, and to give some help on the manner in which educational objectives may be classified in the taxonomy.

Part II is the taxonomy proper, organized into six major classes: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The taxonomy categories are arranged in a hierarchical order reflecting the different classes of educational objectives. Each one of the categories contains, in order: (1) a definition of the category, (2) illustrative objectives, (3) a discussion of problems and considerations in testing objectives in the category, and (4) examples of items testing objectives in the category. Each test example is briefly discussed to note what is required of the student and how this is achieved. The reader is referred to the condensed

version of the taxonomy in the Appendix for a brief definition of each class and its subclasses. A fuller treatment of the taxonomy is contained in Part II.

Borgen, F. H., & Weiss, D. J. Cluster analysis and counseling research. Journal of Counseling Psychology, 1971, 18, 583-591.

The authors of this paper state that the unique application of most cluster analytic methods is to situations where discrete, categorical placement of objects or variables is desired. This is the case where the objective of the research is to classify a set of variables (or objects or people) in order to develop a taxonomy for the variables. Therefore, cluster analysis is a useful tool for many kinds of counseling research because of its organizing or taxonomic properties.

Cluster analysis is a method for reducing variance within groups, that is, clustering objects by similarity, but it typically does this using *multivariate* information on the objects. Thus, cluster analysis methods generally minimize differences within groups over some multivariate space. Three components for the empirical solution of any clustering or taxonomic problem are (1) multivariate data which are appropriate for a particular grouping problem, (2) a measure of similarity between each possible pair of objects or variables which are to be clustered, that is, a measure of profile similarity, and finally (3) some method of cluster analysis for grouping the objects. A scientist has the choice of numerous alternative similarity measures and clustering methods.

Quite independently of the choice of a similarity measure, the investigator must determine whether any transformations should be applied to the raw data before calculating measures of similarity. Although such decisions as reducing to orthogonal components, standardizing data, or equating variances may sometimes be difficult to make, the choices made will nearly always affect the cluster results, particularly when people (rather than variables) are to be clustered.

One useful way of thinking about cluster approaches is in terms of whether they yield nonhierarchical or hierarchical solutions. The nonhierarchical approaches represent the effort to group a set of objects into groups of maximum similarity. The hierarchical cluster methods permit the grouping of clusters into "super-clusters" in much the same way as the factor analysis of factors yields second-order factors. The hierarchical viewpoint focuses on the relationships among the clusters; for some research problems, knowledge of hierarchical structure may be particularly useful for theoretical or taxonomic classification.

The following nonhierarchical cluster methods are discussed: Rao's use of a matrix of Mahalanobis' distances, transposed factor analysis, Tryon's methods for cluster analysis, Cattell's and McQuitty's contributions to cluster analysis, as well as other nonhierarchical grouping methods. Under hierarchical clustering methods, the following approaches are discussed: McQuitty's tree-like structuring of variables or objects, Ward's hierarchical grouping analysis, and Johnson's hierarchical methods.

Several evaluative criteria are suggested to appraise alternative clustering methods, including availability, discriminability, replicability, and validity. The authors conclude by warning of the serious hidden dangers of basing a cluster analysis completely or primarily on random data. They recommend using multiple methods since important characteristics of a set of data may be overlooked if a single clustering method is used.

Bretz, R. A taxonomy of communication media. Englewood Cliffs, NJ: Educational Technology Publications, 1975(?).

Although much has been written about techniques of artistic expression in various media and about the social implications of the more pervasive of these, there is little of communication theory that is useful to those who must make decisions concerning the applications of the new technologies. It is to fill the need in this area that the present monograph was conceived.

Chapter 4 of this monograph describes a proposed taxonomy of communication media. Since communication media are all the product of man's inventiveness, there is no natural relationship among them to discover; therefore, some artificial means of classification must be chosen. The author establishes a set of criteria for distinguishing between (1) a medium and nonmedium, (2) one medium and another, and (3) a single medium and a multimedia application.

In the past, communication media have been classified in various ways. Purpose, for example, used as a basis for classification, divides the field into such classes as information, instruction, and entertainment. This is really a classification of user systems though, not of the media themselves. Mass media may be distinguished from media which are limited to group or individual use. Media have also been divided into those that are essentially two-way and are used for intercommunication and those that are essentially one-way.

One trouble with most of these classification systems is that they are based on current and possibly temporary characteristics. On the other hand, division into telemedia and recording media is permanent because it is clearly an intrinsic differentiation. The ways in which a medium represents information define another basic and intrinsic set of characteristics. These ways are, basically, audio and visual, with the added possibility that the visual elements may be given motion.

Seven classes of communication media are defined. *Class I: Audio-Motion-Visual* is the most encompassing of all the media classes since it utilizes all audio and visual means of representation. *Class II: Audio-Still-Visual* is the second most encompassing media class; it is capable of everything that Class I media can do, except the representatio of motion.

Media of *Class III: Audio-Semimotion* are called semimotion because they are capable of pointing and buildup but do not include the capacity to transmit or record full or realistic motion. *Class IV: Motion-Visual* is capable

of everything included in Class I except audio. *Class V: Still-Visual* media represent information with all the visual methods, but do not represent motion, except by implication. It is the only class that is not time-based.

Media using sound only, such as tape, disc, and radio, comprise *Class VI: Audio*. Media of *Class VII: Print* represent information only through alphanumeric and other symbolic characters. Teletype and punched paper tape are the only current examples of telemedia and recording media in this class.

Chambers, A. N. Development of a taxonomy of human performance: A heuristic model for the development of classification systems (Technical Report No. 4). Silver Spring, MD: American Institutes for Research, March 1969. (NTIS No. AD-688 605)

This report presents a heuristic model for analysis of the issues involved in the classification of human performance. With this model as a framework, the following main areas of concern are addressed: (1) the objectives of behavioral scientists and human factors technologists, (2) the classes of variables involved in the prediction or production of human performance, and (3) functional relationships among variables. The three major issues of classification then are discussed in turn---the "why," "what," and "how" of classification. Under the "why" or objectives of classification, the modes of operation of behavioral scientists and human factors technologists are described and some examples are included. The discussion concludes with some generalizations about the role of classification as aids in information retrieval, in generalization and prediction, and in relating classes of variables.

Under the "what" or conceptual bases of classification, the following content or organization is suggested: (1) classification of descriptors, (2) classification by dimensions, (3) classification within and between classes of variables, (4) classification of sequences of independent-dependent variables, (5) classification of nonhuman performance classes of data, (6) classification of measures and measurement techniques, and (7) classification of methods. The discussion continues with some comments about "basic building blocks." It was concluded that even though there are many classification systems available on which to build, they are fragmentary, inconsistent, and their utility usually has not been established. But equally important, they provide the building blocks on which substantial and useful systems can be built.

Under the "how" or methodological bases for classification, the following topics are considered: (1) naming or numbering of characteristics, (2) semantic methods of classification, and (3) measurement methods for classification.

The report then attempts to summarize both the technical and practical problems that can be expected to occur if various approaches to classification are used. The report concludes with some recommendations about what the author believes is required if significant progress is to be made in the

further development of human performance classification systems. Within the context of discussing the options and priorities which seem to exist regarding further developmental efforts, the author notes that the development of a comprehensive classification system at either the broad descriptor level or the variable descriptor level is a gigantic undertaking---even building upon presently available concepts and data. It would seem that the most substantial progress could be made if an attempt is made to utilize and integrate the data and concepts at hand rather than looking for some simple or novel approach to classification.

An extensive appendix presents provisional classifications of human performance descriptors including human responses, performance capabilities, operations, equipment and materials, personnel, physical environments, social environments, selection, training, human physical moderators/mediators, physiological moderators, and psychological moderators/mediators.

Chiles, W. D. Methodology in the assessment of complex performance: Discussion and conclusions. Human Factors, 1967, 9, 385-392.

This paper summarizes the discussion elicited by the presentation of a series of papers at a 2-day conference on methodology in the assessment of complex performance. The papers provided the substance for the discussion of a variety of methodological problems encountered in carrying out research for the purpose of assessing the capabilities of the human operator to perform complex tasks. Subsequent to the conference, the tape recordings of the discussion were perused, and a series of statements were identified as representing possible points of agreement on the issues considered. These statements were evaluated on a semantic differential scale (agree vs. disagree) by 15 individuals who participated in the conference.

The most important conclusions relate to the criterion problem, task taxonomies, the reliability of measures, and the role of face validity in the design of research apparatus. Of the 35 statements submitted to the conference participants, six dealt with taxonomic issues. Overall, good agreement among the conferees was evident concerning the need for a taxonomy of performance functions and about most of the properties of such a taxonomy. These properties were defined as (1) the taxonomy must facilitate communication among researchers and between researchers and applications people, (2) the taxonomy must yield agreement among the categorizers, and (3) the performance functions included within a category of the taxonomy must prove to be homogeneous with respect to "behavioral laws." Further, it was felt that the "primitive taxonomy" used in one's everyday transactions with fellow researchers could serve the research community in at least some domains of performance assessment---at least up to the point that researchers could get on about their work. On the final taxonomic statement suggesting that a behavioral taxonomy must underlie the tasks being used if generality is to result, the conferees were rather evenly divided in their level of agreement with the statement.

Christensen, J. M., & Mills, R. G. What does the operator do in complex systems? Human Factors, 1967, 9, 329-340.

An effort was made to locate representative data on human activities in complex operational systems. Very little operational data were found which were suitable for the authors' purposes. Therefore, this requirement was compromised, and activity data from tests and paper and pencil analyses were used. These data then were classified by two raters according to an adopted taxonomy. The taxonomy used was that of C. Berliner, D. Angell, and J. W. Shearer. In this taxonomy, behaviors are placed in a hierarchical classification structure beginning with processes that are broken down into activities at the second level and further particularized as specific behaviors at the third level in the hierarchy. The Berliner et al. taxonomy was one of several alternatives considered by the authors. This classification scheme was selected because it appeared to be relatively easy to use and reasonably comprehensive with respect to its coverage of specific behaviors (e.g., detects, locates, interpolates, compares, transmits, presses, aligns). However, since none of the data was gathered with this classification scheme in mind, it was applied with considerable difficulty in some cases, and some activity data could not be made to fit into this taxonomy at all.

In an effort to assess the degree of agreement between classifiers, each of the two authors independently classified the activities of nine operators. Rank-order correlations (rho's) were computed for the two classifiers. These rho's ranged from +.29 to +1.00, with a median of +.78. While the lowest of these coefficients is unacceptable, the authors felt that on the whole satisfactory agreement can be obtained if operator activities can be defined in clear, unequivocal terms and in sufficient detail so that those classifiers not completely familiar with the job could still use the information.

It was generally concluded that where activity data have been gathered under operational conditions, they have been useful to design engineers, human factors specialists, and systems analysts. However, it was further noted that additional effort must be devoted to the development of better methods for obtaining data and corresponding criteria of human performance under operational conditions. A discussion of the taxonomy and other techniques indicated that collection of activity data should be feasible under operational conditions. In addition, it was suggested that increased standardization and use of operational definition in the development of these techniques might result in improvement of their general applicability.

Davis, E. W. A functional pattern technique for classification of jobs. New York: Teachers College, Columbia University, 1942.

The problem of this dissertation was to investigate the relationship between job titles and the functions performed by men in the advertising profession in order to devise and demonstrate a technique for setting up typical "functional patterns" as a basis for classifying positions in an occupation. The method of classification is based on grouping the general and specific functions performed by individuals in advertising jobs into constellations or patterns of functions.

The data used in illustrating this technique were obtained from the case histories or questionnaires answered by 4,989 advertising men. In each case history it was possible for each advertising person to check any one of the 26 positions listed, or to add miscellaneous ones to the list. From one to 25 specific functions were classified as subheadings under four general functional groups. Each individual also checked or listed any one of 13 types of businesses in which he engaged in these functions in his last position.

In making a code for each different functional pattern, a numerical coding system of geometric progression, known as a geometric term code, was devised for each subfunction under the four groups of general functions. By means of five sets of 2-place or 3-place numbers interspersed with dashes, it was possible to represent the entire pattern of four general functions and of 25 specific functions and at the same time use only 11 columns on a Hollerith card. The use of numerically coded patterns of functions made it possible not only to analyze and tabulate the functions of positions more precisely but also to identify quickly the actual 2,746 different patterns of the 4,989 men out of a possible total of 33,554,431 different patterns.

There was found a predominance of persons in rare functional patterns over persons in common functional patterns. However, in studying the frequency distribution of common specific patterns in advertising positions, a modal pattern stood out rather prominently in all positions except three which were bimodal in their distribution. In additon to the modal pattern, there were usually a few other numerically prominent common patterns which further identified each position. In positions found in several businesses, the different common patterns were often drawn from different businesses. In most positions, however, the common patterns were usually the same regardless of the business in which they were found.

Thus, advertising positions can be classified by means of the most common functional pattern of actual individuals rather than by listing the functions of a hypothetical "average" worker or still more vaguely by giving merely the title of the job. The limitations of the traditional structural type of "average-man" functional analysis of positions are discussed, and the traditional structural type of functional analysis and the newly demonstrated functional pattern analysis are compared. The advantages of the functional pattern technique of job classification over the structural method are enumerated.

DeNisi, A. S., & McCormick, E. J. The cluster analysis of jobs based on data from the Position Analysis Questionnaire (PAQ) (Report No. 7). West Lafayette, IN: Purdue University, Department of Psychological Sciences, September 1974.

Two cluster analysis procedures were used in the clustering of jobs on the basis of data from the Position Analysis Questionnaire (PAQ). The PAQ is a structured job analysis procedure that provides for the analysis of jobs in terms of each of 187 job elements, these job elements being grouped into six

divisions as follows: (1) information input, (2) mental processes, (3) work output, (4) relationships with other persons, (5) job context, and (6) other job characteristics.

On the basis of previous research, a series of principal components analyses of the PAQ data had been carried out. One series consisted of independent analyses of the job elements within each of these six divisions, the results consisting of the identification of 30 principal components (called "divisional" job dimensions). In turn, an overall or general principal components analysis was based on data from 168 of the 187 job elements (called "general" or G job dimensions).

One of the clustering procedures used was the BC-TRY program (Tryon, R. C., & Bailey, D. G. Cluster analysis. New York: McGraw-Hill, 1970.). This clustering was carried out with the 14 overall or general (G) job dimensions as applied to a reasonably varied sample of 3,700 jobs. This program resulted in the identification of 33 job clusters.

The other clustering procedure was based on the scores on 21 of the "divisional" job dimensions for a sample of 800 jobs (a subsample of the 3,700 jobs mentioned above). The clustering consisted of the use of a hierarchical grouping technique as applied to the data for these jobs. In particular, the clustering was carried out with an adaptation of CODAP (Comprehensive Occupational Data Analysis Programs) as developed by the United States Air Force. This clustering resulted in the identification of 45 clusters which seemed to have reasonable homogeneity.

A subjective comparison and a statistical analysis of the results of these two clustering procedures give the impression that the clusters resulting from the BC-TRY program were somewhat more homogeneous than those resulting from the CODAP adaptation. However, this difference may more likely be associated with the differences in the nature of the job dimensions used in the two instances (those based on the various "divisions" of the PAQ as contrasted with the general or G dimensions) rather than being associated with the clustering procedures as such.

Farina, A. J., Jr. Development of a taxonomy of human performance: A review of descriptive schemes for human task behavior (Technical Report No. 2). Silver Spring, MD: American Institutes for Research, January 1969. (NTIS No. AD-689 412)

This paper examines schemes which have been designed to describe the human behaviors occurring in the performance of tasks. Such schemes attempt to structure total task behavior by providing labels, definitions, and, occasionally, models for describing the behavioral parts comprising the whole. The emphasis in these schemes is on description. The author's purpose in examining them was to see if they also have utility for classification purposes. A distinction is made between descriptions and classification in that the latter process encompasses the former and involves comparison among or between objects or units being studied.

The schemes reviewed in this report are grouped in terms of the approaches taken in describing human task behavior. The first approach focuses on the functions which man engages in during task performance (human functions); generally, the descriptors here refer to internal processes. A second type of approach employs a mixture of internal processes and overt response descriptors. Finally, there is the descriptive approach which utilizes the concept of human abilities.

The schemes reviewed under the human functions approach are R. B. Miller's task analysis process in which he proposes a scheme for the behavioral structure of a task; R. M. Gagne's scheme for conceptualizing all human functions as combinations of three basic functions---sensing, identification, and interpretation; E. A. Alluisi's list of critical functions performed by operators in man-machine systems which are essential to performance; and J. S. Kidd's descriptions of some of the varieties of information-processing and decision-making functions.

Five schemes falling under the internal processes and overt responses approach are reviewed. J. D. Folley's theory is a system of interrelated definitions, constructs, and hypotheses relating task attributes to training requirements. D. C. Berliner et al. developed a behavioral classification scheme whose categories would be meaningful in selecting optimal methods of measuring performance. The descriptors chosen for their scheme are arranged in a hierarchical fashion based on processes, activities, and specific behaviors. To classify behavior, M. P. Willis developed a 3-level hierarchical scheme in which specificity and detail of description increase as one proceeds down through the levels. The scheme follows a general input-output model. R. O. Peterson et al. developed a scheme for grossly describing tasks in terms of three types of behaviors---receiving inputs, processing the input information, and taking action (output). A. A. Lumsdaine, in his treatment of training objectives, used a classification which speaks indirectly to the question of describing human task behavior.

Under the human abilities approach, the objective of E. A. Fleishman's work has been to define the fewest independent ability categories which might be most useful and meaningful in describing performance in the widest variety of tasks. J. P. Guilford has developed a morphological model which organizes intellectual abilities along three dimensions---operations, products, and content.

The areas of job analysis and job classification are viewed by the author as secondary sources for descriptive schemes of human task behavior. One scheme, that of E. J. McCormick, is presented briefly.

The author concluded that in general, the available schemes are hampered by one or more of several factors: (1) imprecise terms, (2) little measurement capability, or (3) a lack of development of the scheme to a point where it may be readily applied to real world tasks. The logic of describing tasks in behavioral terms is examined with a final conclusion being reached that tasks per se are more appropriately described in terms of nonbehavioral task characteristics.

Farina, A. J., & Wheaton, G. R. Development of a taxonomy of human performance: The task characteristics approach to performance prediction (Technical Report 7). Silver Spring, MD: American Institutes for Research, February 1971. (NTIS No. AD-736 191)

Of the many conditions which can influence human performance, the most poorly described and least understood are those embodied in the task. As a consequence, the ability to relate performance observed in one task to that observed in other tasks is limited. The present report describes a series of studies conducted to develop an instrument in terms of which the stimulus, procedural, and response characteristics of tasks could be described. It discusses additional studies which were designed to determine whether dimensions comprising the descriptive language represented correlates of human performance.

The basic steps in this research were to (1) develop descriptive characteristics of tasks, (2) assess the reliability of rating scales devised to measure these characteristics, and (3) determine if these characteristics represented correlates of performance.

The overall direction taken by the project was influenced by a heuristic model which viewed performance as a function of three sets of antecedent conditions: the operator, the environment, and the task. A decision was made to focus initial efforts on the task component of the model, holding the other components in abeyance.

Toward this end, major components of a task were identified and treated as categories within which to devise task characteristics or descriptors. Each characteristic was cast into a rating scale format which presented a definition of the characteristic and provided a 7-point scale with defined anchor- and mid-points along with examples for each point. Nineteen scales were developed and evaluated in a series of three reliability studies.

The paradigm used to determine whether the task characteristics were correlates of performance upon which predictive relationships might be established was that of "postdiction." Postdiction referred to the situation in which performance measures were abstracted from studies already existing in the literature. Subjects rated descriptions of the tasks used in these studies on task characteristic scales and then these ratings were subjected to multiple regression analysis to establish the extent to which they were related to the performance in question. Two such postdiction studies were conducted. The first study involved six scales and 26 tasks while the second study involved six scales and 20 tasks.

In general, it was found that a subset of scales having adequate reliability consistently emerged in all three reliability studies. The results of the two postdiction studies were encouraging in that significant multiple correlations of .82 and .73 were obtained between task characteristic ratings and the performance measures.

Although a final interpretation of these findings must await cross-validation efforts, it does appear possible to describe tasks in terms of a task-characteristic language which is relatively free of the subjective and

indirect descriptors found in many other systems. Further, task characteristics may represent important correlates of performance; as shown in this research, it was possible to describe subtle differences among tasks and to relate such differences systematically to variations in performance.

Fleishman, E. A. Development of a behavior taxonomy for describing human tasks: A correlational-experimental approach. Journal of Applied Psychology, 1967, 51, 1-10.

The need for identifying a set of unifying dimensions underlying skilled behavior is discussed. The issues bear on problems of generalizing principles from laboratory to operational tasks and from one task to another. Combinations of experimental and correlational approaches appear to be required. The conceptual framework and research strategy utilized by the author in his research on perceptual-motor abilities is described, and its relevance to taxonomy questions is discussed.

In previous research, the author and his colleagues conducted a series of interlocking, experimental, factor-analytic studies, attempting to isolate and identify the common variance in a wide range of psychomotor performances. Thus far, they have investigated more than 200 different tasks administered to thousands of subjects. From the patterns of correlations obtained, they have been able to account for performance on this wide range of tasks in terms of a relatively small number of abilities.

There are about eleven psychomotor factors and nine factors in the area of physical proficiency which consistently appear to account for the common variance in such tasks. The psychomotor labels are Control Precision, Multilimb Coordination, Response Orientation, Reaction Time, Speed of Arm Movement, Rate Control, Manual Dexterity, Arm-Hand Steadiness, Wrist-Finger Speed, and Aiming. In the physical proficiency area, the factors have names such as Extent Flexibility, Dynamic Flexibility, Static Strength, Dynamic Strength, Explosive Strength, Trunk Strength, Gross Body Coordination, Gross Body Equilibrium, and Stamina.

In this paper, the integrative nature of the framework developed is illustrated by a wide variety of studies, in laboratory and operational situations, ranging from those of skill learning and retention to the effects of environmental factors on human performance, and in the standardization of laboratory tasks for performance assessment.

Fleishman, E. A. Performance assessment based on an empirically derived task taxonomy. Human Factors, 1967, 9, 349-366.

This report reviews and discusses a number of the methodological questions relating to the application of an experimental-correlational approach to the problem of assessing complex performance. The basic point of depar-

ture is the specification of the requirements for a task taxonomy and an analysis of the value of factor analytic investigations in combination with experimental methods in providing the framework for such a taxonomy.

The author believes that combinations of experimental and correlational methods can develop a taxonomy of human performance which is applicable to a large variety of tasks and situations. The author and his colleagues have conducted a series of interlocking experimental-factor analytic studies, attempting to isolate and identify the common variance in a wide range of perceptual-motor performances. More than 200 different tasks administered to thousands of subjects in a series of interlocking studies were investigated. From the patterns of correlations obtained, these researchers were able to account for performance on this wide range of tasks in terms of a relatively small number of abilities.

There are about eleven psychomotor factors and nine factors in the area of physical proficiency which consistently appear to account for the common variance in the tasks studied. The eleven psychomotor factors identified were Control Precision; Multilimb Coordination; Response Orientation; Reaction Time; Speed of Arm Movement; Rate Control; Manual Dexterity; Finger Dexterity; Arm-Hand Steadiness; Wrist, Finger Speed; and Aiming. The following nine factors accounted for performance in more than 60 different physical fitness tasks: Extent Flexibility; Dynamic Flexibility; Explosive Strength; Static Strength; Dynamic Strength; Trunk Strength; Gross Body Coordination; Gross Body Equilibrium; and Stamina.

The way in which this approach has been applied in the past and the expected benefits of its successful implementation are discussed. It was concluded that experimental-correlational studies offer considerable promise in attacking complex performance, but that a more extensive research program is needed. The general outlines of such a program are described.

The author concludes that the centrality of the taxonomy problem is critical to military psychology, to problems of assessing complex performance, and to many questions of generalizing from system to system. The author feels that there is a need for research along these parallel lines to include the following: (1) an integrative literature review using a consistent set of performance categories to develop principles of what kinds of performances are affected by what kinds of treatments, environmental factors, procedures, etc. - this review would utilize the categories derived from experimental-correlational studies of human tasks; (2) the development of interim standard performance testing facilities using currently available data about task dimensions, rather than the usual armchair categories, and the validation of such facilities against operational performance; and (3) a long-range experimental program concerned with developing a behavioral-task taxonomy by systematic, programmatic task manipulations.

Fleishman, E. A., Kinkade, R. G., & Chambers, A. N. Development of a taxonomy of human performance: A review of the first year's progress (Technical Progress Report 1). Silver Spring, MD: American Institutes for Research, November 1968. (NTIS No. AD-684 583)

This report briefly describes technical progress during the first year of a 5-year project to develop and verify a taxonomic system for the classification of human task performance. During this initial year, the major efforts on the project proceeded along four lines of activity: (1) review of previous taxonomic efforts, (2) development of an integrative model, (3) development of provisional classification schemes, and (4) development of a human performance data base.

Previous taxonomic efforts were reviewed to provide guidelines and suggest approaches for the development of classification systems. Three areas of review were conducted. One area concerned previous classification systems developed in the behavioral sciences with emphasis on their purposes and methods. The second area concerned a more detailed look at various descriptor schemes for classification systems including those derived from task analysis. The third area concerned classification systems developed in the biological and other physical sciences and their implications for taxonomic problems in the behavioral sciences.

An integrative model was developed to indicate which areas had to be taken into account in the development of a comprehensive task taxonomy. Attention was given to the development of a model of human performance as a means for more systematically exploring the role of classification in the behavioral sciences and human factors technologies. This, in turn, is intended to provide a basis on which further developmental efforts at classification can be undertaken.

A provisional classification scheme, based on human abilities identified in earlier correlational studies, was developed to indicate the feasibility of using such an approach and to isolate some of the practical problems that might be encountered in the development of a taxonomy. Work on another provisional classification scheme, based on observable characteristics of tasks, also was initiated.

The requirements of a Human Performance Data Base were defined to provide a resource and a research tool for testing provisional classification systems being developed. An information system is under development to provide access to the research relevant to the classification of human performance. An initial step in the development of the system is the creation of a "controlled vocabulary." Another initial step required to achieve a standardized data file is the development of a standardized indexing format.

Finally, plans for the immediate future, including twelve activities, were developed to insure continuity to the present efforts.

Fleishman, E. A., & Stephenson, R. W. Development of a taxonomy of human performance: A review of the third year's progress (Technical Progress Report 3). Silver Spring, MD: American Institutes for Research, September 1970. (NTIS No. AD-721 217)

The purpose of the taxonomy project conducted by American Institutes for Research is to develop and evaluate systems for describing and classifying tasks which can improve generalization of research results about human performance and to develop a common language for communicating between researchers and individuals who need to apply research to personnel problems. During two previous project years, three different taxonomic systems were developed, each of which seemed to have maximum relevance for a different type of application: the ability requirement approach, the task characteristics approach, and a third approach based on information theory.

During the third project year, two of the three provisional approaches were subjected to user-oriented evaluations. The ability requirement and the task characteristics approaches were used to postdict mean values of performance measures and relevant factor loadings for a variety of tasks. Work also was initiated on the design of binary decision flow diagrams of the type that will simplify decisions about ability requirements so that decisions can be made by relatively untrained personnel. The information theory approach was revised and reformulated as a more general systems language approach; a specially designed experimental apparatus was built for its evaluation. Also, as a separate effort, a new "information processing" systems language was developed which seemed to be more readily adaptable to the description of complex tasks. Finally, some evaluation was made of a criterion measure classification scheme.

Progress was made toward the development of computer-compatible information retrieval procedures developed to allow interested users to retrieve data according to the task descriptive system of interest. These procedures were applied to several portions of the Human Performance Data Base (assembled previously) with promising results.

Fleishman, E. A., Teichner, W. H., & Stephenson, R. W. Development of a taxonomy of human performance: A review of the second year's progress (Technical Progress Report 2). Silver Spring, MD: American Institutes for Research, January 1970. (NTIS No. AD-705 671)

The present research is a 5-year effort intended to develop and evaluate a taxonomy of human performance. This report is a review of technical progress achieved during the second year. During the second year of the project, a more sophisticated formulation of the problem was developed which recognized the need for different task taxonomic systems in accordance with the requirements of military users. Three provisional approaches (each of which seemed to have maximum relevance for a different type of military user) were selected: the ability-requirement approach, the task-characteristics approach, and a third approach using a systems-language model.

Several pilot studies were conducted with various versions of ability-requirement rating scales. Some difficulty was found in obtaining rater agreement with these scales, indicating that a number of aids to agreement and modifications in design were necessary. Future plans for these rating scales call for an evaluation with respect to their ability to postdict.

Twenty-five task description rating scales were developed and revised to describe six selected tasks. Future plans for these rating scales call for one additional revision to obtain greater coverage of task dimensions. The resultant version of the rating scale then will be subjected to evaluations of its ability to postdict and to predict.

The systems-language approach differs from the other provisional approaches in that it is based on a general model which starts with a set of definitions, relationships, and classes. The systems language also is more general in that it is eventually designed to encompass the other two provisional approaches. This will require a translation between the three language systems. Future plans call for an evaluation of this approach with the aid of a series of laboratory investigations and computer simulations.

Work also was initiated on the development of user-oriented evaluation systems by which the procedures associated with these three provisonal approaches could be evaluated.

Finally, a specially selected Human Performance Data Base was assembled, and information retrieval procedures were designed which would allow interested users to retrieve data according to the task descriptive system of interest. The data base was designed to serve both as a resource for other project efforts and as a research tool. Future plans for this data base call for its use to evaluate successive versions of the provisional classification systems.

Plans for the third year of this project include the continued development of the language systems associated with the three provisional approaches, repeated evaluations from the viewpoint of their ability to facilitate applied decisions, translation among the three language systems, and the integration of the language systems into a more comprehensive systems approach.

Hartigan, J. A. Representation of similarity matrices by trees. Journal of the American Statistical Association, December 1967, 62, 1140-1158.

A frequent form of statistical data consists of a set of objects with a list of properties associated with each object. If the properties consist of measurements of k variables, there is a considerable literature on methods such as factor analysis and eigenvector analysis for reducing the number of variables required to explain the variability among the objects; these methods imbed the objects in some Euclidean space of smaller dimension than k. An alternative approach to the data is to seek similarity groupings among the objects; this is the approach historically used in classification procedures in the natural sciences where the list of properties associated with each object may not consist of measurements.

Suppose that given a set of similarities (or dissimilarities) between pairs of objects from some set of objects (such as animal species, books, colors, etc.) we wish to construct from this similarity matrix a tree, or nested set of clusterings of the objects. Graphs of trees provide a striking visual display of similarity groups of the objects. Tree classifications have long been used in biology, although it is only in relatively recent years that attempts have been made to generate such trees from similarity matrices. A similarity tree may be represented by a *dendrogram*. A *tree table* is similar in computation to a dendrogram but is simpler to use in output and publication, with a slight loss in visual effect.

The construction of a similarity tree requires (1) a definition specifying when a similarity matrix has exact tree structure; (2) a measure of distance between any two similarity matrices, which yields when combined with (1) a measure of distance between any similarity matrix and any tree; and (3) a family of local operations on a tree, which can be used to search out trees which best fit a given similarity matrix. The construction technique was applied to voting behavior of the 50 states in the U.S.A. in the last 13 presidential elections, providing a tree clustering of the states.

Henry, G. L. The Navy enlisted all-digit classification system: An analysis (WTR 73-40). Washington, DC: Naval Personnel Research and Development Laboratory, June 1973.

This report contains a brief history of the development of the Navy's currently used alpha random-numeric enlisted classification system and a recapitulation of prior research directed toward design of an optimum enlisted classification structure. The alpha random-numeric enlisted classification system currently used in the Navy to provide qualitative identification of enlisted personnel and billets (requirements) is based on occupational groupings called general ratings, service ratings, emergency ratings, and Navy Enlisted Classification Codes (NEC's). The proliferation of NEC's, the increasing difficulty involved in recording, monitoring, and updating NEC's, and the continued difficulty encountered by detailers in matching personnel with billets indicates that a better enlisted classification system is needed. The objective of this research was to determine if it is feasible to design and implement an all-digit enlisted classification system which would better serve the needs of the Navy for personnel and billet identification.

The occupational classification systems of the other U.S. military services, the DOD occupational groupings, and the Department of Labor's *Dictionary of Occupational Titles (DOT)* classification system are analyzed with a view towards determining characteristics which might be adapted to a Navy all-digit enlisted classification system. Prerequisites for design of a classification system, and requirements and procedures for testing a classification system are presented. A tentative realignment of present occupational groupings and some examples of experimental classification systems are shown.

The research failed to disclose any new system that would so significantly improve the Navy's capability to identify skills and requirements as

to be worth the expenditure of money and manpower necessary to develop and implement a new system. Proposals are made regarding actions to be taken prior to expenditure of further effort on development of any new Navy enlisted classification system.

Jardine, C. J., Jardine, N., & Sibson, R. The structure and construction of taxonomic hierarchies. Mathematical Biosciences, 1967, 1, 173-179.

In this paper a logical model for taxonomic hierarchies is formulated. From it is derived a theoretical framework within which the clustering techniques by which taxonomic hierarchies are obtained in numerical taxonomy may be discussed.

A major problem in numerical taxonomy is to find and justify clustering techniques by which a taxonomic hierarchy may be derived from measures of similarity between all pairs of basic taxa in a given set. The measures used are often metrics, or are simply transformable into metrics. The clustering techniques used frequently go from the metric to the taxonomic hierarchy by way of a dendrogram, which may loosely be defined as a hierarchy with numerical levels determined by the original data. Thus, it is immediate that the dendrograms on a finite set are in 1-1 correspondence with the ultrametrics, and that the passage from dendrogram to hierarchy consists of the choice of the function σ. The function determines the taxonomic rank assigned to clusters. These authors allow σ to be nonstrictly monotone except at 0 so that they may aggregate together in the hierarchy levels that are distinct in the dendrogram. Various numerical methods for choosing σ may be devised: for example, it might be chosen so as to make the aggregation of levels correspond with an observed tendency for the levels to clump about particular values.

In analyzing the transformation of a metric into an ultrametric (i.e., dendrogram), there are three obvious requirements. (1) A unique result should be obtained from given data. (2) Small changes in the data should produce small changes in the result; that is, the transformation must be *stable*. (3) In some sense, the result obtained should be the best possible under any additional conditions imposed. Within this theoretical framework, some clustering methods are considered briefly. The clustering methods considered are all agglomerative, that is, methods in which dendrograms are derived by progressive fusion of members of the basic set of taxa.

It is concluded that some widely used techniques fail to satisfy certain obvious requirements. A *single-link* clustering process satisfies the contraction condition, whereas *complete-link* clustering processes satisfy the expansion condition. Most *average-link* clustering processes satisfy neither the expansion nor the contraction conditions. A single-link clustering process often is said to suffer from the shortcoming of grouping together at a relatively low level taxa linked by chains of intermediates. Average-link processes try to avoid this, but are rendered unsatisfactory by discontinuity. The authors conclude that a different approach is indicated and suggest as an alternative the addition of further conditions to the contraction condition so that groups that are in some sense homogeneous are clustered preferentially.

Jardine, N., & Sibson, R. A model for taxonomy. Mathematical Biosciences, 1968, 2, 465-482.

In a 1967 paper (The Structure and Construction of Taxonomic Hierarchies), it was concluded that, of the methods of cluster analysis reviewed, only the single-link (nearest neighbor) method satisfied certain obvious requirements. However, this method is limited by its chaining tendencies. Such methods as the average-link methods and the complete-link method attempt to avoid chaining, but fall prey to much more serious defects. In this earlier paper it was suggested that it might be possible to avoid chaining in a hierarchic system by further operations on the clusters obtained by the single-link method, but this proved to be a fruitless approach.

The authors suggest that the limitations of the single-link method are limitations of hierarchic classification itself, and that these limitations can be overcome by using a more general system of classification. In the remainder of this paper, they show how, by generalizing the model for taxonomic hierarchies to cover systems in which taxa may have overlapping extensions, it is possible to derive numerical classificatory methods that reveal the kinds of information that are concealed by chaining, for example, information about the relative coherence or homogeneity of clusters.

Taxonomy may be explicated as a 2-stage process. The first stage is the derivation of a dissimilarity coefficient based on the distributions of states of characters (attributes, or properties) amongst the objects to be classified. The second stage is the derivation of a taxonomic system from the dissimilarity coefficient. In discussing numerical methods for the construction of taxonomic systems, the authors take as their starting point a numerical coefficient expressing the dissimilarity between each pair of objects to be classified. The theoretical framework established in the 1967 paper described the derivation of a taxonomic hierarchy from a metric dissimilarity coefficient by way of a dendrogram, which may be loosely defined as a hierarchy with numerical levels determined by the original data. The theoretical framework established in this 1968 paper describes the derivation of a more general kind of taxonomic system from a dissimilarity coefficient by way of a suitably generalized dendrogram. The requirement that the dissimilarity coefficient be metric is relaxed. Passage from a dendrogram to a taxonomic system is shown to be straightforward and is discussed only briefly. The authors concern themselves primarily with the passage from a dissimilarity coefficient to a dendrogram.

The authors have given a general model for taxonomic systems and have described the simplest numerical method available under certain constraints, for deriving such systems from dissimilarity coefficients. They show that the single-link method leading to a hierarchic classification should be regarded as the first term in a sequence of classificatory methods giving successively more accurate but more complex representations of the data. Within the theoretical framework established, they define measures of the distortion imposed by a classificatory system, and of the relative isolation and homogeneity of clusters. The numerical method shown to be the simplest satisfying certain necessary constraints is illustrated by means of an artificial example.

Jardine, N., & Sibson, R. Mathematical taxonomy. New York: John Wiley & Sons, 1971.

This book provides a mathematical account of some of the methods of data simplification which are involved in or suggested by the practice of biological taxonomy. The computable methods derived are offered as potentially useful tools for taxonomists, rather than as substitutes for their activities.

Superficially similar problems of data simplification arise in pattern recognition and in the various sciences which make substantial use of classificatory systems: biological taxonomy, ecology, psychology, linguistics, archaeology, sociology, etc. But more detailed examination shows that the kinds of classification used and the kinds of data on which they are based differ widely from science to science. While some of the methods described in this book are more widely applicable, discussion has been deliberately limited to biological taxonomy. The emphasis throughout is on the clarification of the mathematical properties of methods of automatic classification and of the conditions under which their application is valid, so that anyone who wishes to apply the methods in other fields shall be aware of their limitations, and of the lines along which they may profitably be developed and modified.

The first part of the book, entitled *The measurement of dissimilarity*, deals with methods for deriving dissimilarity coefficients on a set of populations, given as data descriptions of members of each population. The mathematical basis lies in information theory. The second part of the book, entitled *Cluster analysis*, gives a general treatment of methods for the construction of classificatory systems from data in the form of a dissimilarity coefficient. The mathematics used involves some elementary set theory and some ideas of continuity in a general context.

The third part of the book, entitled *Mathematical and biological taxonomy*, deals with both theoretical and practical aspects of the application in biological taxonomy of the methods developed in Parts I and II. No sophisticated knowledge of biology is assumed. Occasional mention is made of various methods of multivariate analysis and of methods used in pattern recognition. Tables of various statistics and details of algorithmns and programs are given in Appendices 1 to 6. Examples of the application of the new methods developed in this book are given in Appendix 7.

Krathwohl, D. R., Bloom, B. S., & Masia, B. B. Taxonomy of educational objectives. The classification of educational goals. Handbook II: Affective domain. New York: David McKay Co., 1964.

This Handbook is the second of a series of three works. Original plans called for a complete taxonomy of educational objectives in three major parts ---the cognitive, the affective, and the psychomotor domains. The affective domain, which is the concern of this Handbook, includes those objectives which emphasize a feeling tone, an emotion, or a degreee of acceptance or rejection. Affective objectives vary from simple attention to selected

phenomena to complex but internally consistent qualities of character and conscience. A large number of such objectives are expressed in the literature as interests, attitudes, appreciations, values, and emotional sets or biases.

The authors assert that the most difficult part of the task of building the affective domain of the taxonomy was the search for a continuum that would provide a means of ordering and relating the different kinds of affective behavior. An analysis of the objectives of the affective domain showed that each included a range of meanings as they are typically used. The analysis suggested that the concept "internalization" described well the major process of the affective domain. As internalization progresses, the learner comes to attend to phenomena, to respond to them, to value them, and to conceptualize them. The stages of the affective domain are seen as consistent with an empirically and theoretically based point of view on conscience or superego development.

The split between the affective and cognitive domains is for analytical purposes and is quite arbitrary. Actually, the two domains are tightly intertwined. Each affective behavior has a cognitive behavior counterpart of some kind, and vice versa. Each domain is sometimes used as a means to the other, although the more common route is from the cognitive to the affective. The remainder of Part I of the Handbook deals with the classification of educational objectives and measures in the affective domain, and a new look at curriculum, evaluation, and research.

Part II is the taxonomy proper, organized into five major classes: Receiving (Attending), Responding, Valuing, Organization, and Characterization by a Value or Value Complex. The taxonomy categories are arranged in a hierarchical order along a continuum of internalization from lowest to highest. Each of the five sections of the taxonomy contains a brief description of the category and its position in the taxonomy hierarchy. These category descriptions are supplemented by illustrative educational objectives and test items. In addition, evaluation of the achievement of objectives in the category is discussed, the chief purpose of which is to consider some of the major issues in constructing instruments to measure the behaviors of the category.

The reader is referred to the condensed version of the affective domain of the taxonomy in an appendix for a brief definition of each class and its subclasses. For cross-reference purposes, the condensed version of the cognitive domain of the taxonomy of educational objectives also is included as a second appendix.

Lefkovitch, L. P. Hierarchical clustering from principal coordinates: An efficient method for small to very large numbers of objects. Mathematical Biosciences, 1976, 31, 157-174.

In this paper a divisive method for hierarchical clustering, having certain optimal properties, is derived from the properties of matrices of ultrametric distances. Computationally, there is one main step---estimation

of the principal coordinates of the objects, which is little more than the computation of the eigenvalues and eigenvectors of a matrix. The principal coordinates, in descending order of their length, indicate the successive levels of the hierarchy of the dendrogram; furthermore, the signs of the elements of the coordinates indicate the group membership.

An appendix to this paper shows that for many types of data, including variables which may be described as dichotomies, alternatives, multistate unordered or ordered, and continuous, advantage can be taken of the smaller of the two matrix products, XX' or X'X, where X is the matrix of the appropriately transformed data. Since the number of variables often is much less than 200, the number of objects which can be clustered with the algorithm suggested in this paper, using even a medium-sized computer, is virtually unlimited.

Levine, J. M., Romashko, T., & Fleishman, E. A. Development of a taxonomy of human performance: Evaluation of an abilities classification system for integrating and generalizing research findings (Technical Report 12). Silver Spring, MD: American Institutes for Research, September 1971. (NTIS No. AD-736 196)

A preliminary evaluation of the effectiveness of a task classification system based on human abilities for integrating and generalizing research findings was the focus of the research reported in this paper. The evaluation was designed to determine (1) the extent to which abilities could differentiate task performance, and (2) the extent to which such performance could be differentiated with respect to selected independent variables. Fifty-three studies in the vigilance literature were analyzed in terms of abilities required for task performance. The studies then were classified according to one of four predominant abilities: perceptual speed, flexibility of closure, selective attention, and time sharing.

The results showed that different functional relationships between performance and time in the vigil were identified for tasks representing the different ability categories. When studies falling into two of the primary ability categories were partitioned according to levels of three independent variables, marked differences in the functional relationships between performance accuracy and time in the vigil were noted for each independent variable as a function of abilities. A stringent ability rating criterion was used for accepting studies into each of the two primary ability categories. In one case, the functional relationship was almost identical to that obtained under a less stringent rating criterion, while in the other case the relationship was altered. Tasks also were classified in terms of a primary ability required in conjunction with a secondary ability. The functional relationships which resulted were different from those describing task performance and time in the vigil when classified strictly by a primary ability.

Based on these findings, the abilities approach to task classification seems a viable and useful one. Functional relationships were revealed which would have been obscured had the tasks not been classified by the abilities

required. Generalizations about the effects of independent variables on vigilance were enhanced by the approach used. Predictions of performance on new tasks, as a function of these variables, should be facilitated by the application of the task classification system. It was recommended that additional efforts be undertaken to ascertain whether abilities will also prove useful in organizing a more heterogeneous area of experimental literature, using a broader set of abilities.

Levine, J. M., Romashko, T., & Fleishman, E. A. Evaluation of an abilities classification system for integrating and generalizing human performance research findings: An application to vigilance tasks. Journal of Applied Psychology, 1973, 58, 149-157.

The assumption underlying the work reported in this study is that a system for classifying tasks can be developed which would allow more dependable predictions of the effects of independent variables on task performance within and between classes of tasks. Such a system would be especially valuable in making most effective use of available data and for predicting performance on new tasks.

The focus of this article is on the preliminary evaluation of a particular taxonomic system in terms of its capacity to organize a portion of the data found in the human performance literature. The area of human performance selected for examination was that of sustained attention or vigilance behavior. The tasks used in 53 studies in the vigilance literature were classified in terms of the abilities required for task performance. The application of the ability classification system to a body of literature involves the determination of the extent to which an ability is required for task performance. Adaptations of the ability rating scales developed earlier were used to estimate the ability requirements of each task.

Studies were divided into four ability categories based on the predominant ability required for task performance. For studies falling within each category of tasks, mean performance computed across studies was plotted as a function of time in the vigil. The curves relating time in the vigil to detection accuracy were found to differ as a function of the ability requirements of the tasks. Similarly, when the effects of selected independent variables (e.g., signal rate, sensory mode, and knowledge of results) on performance were examined, different functional relations were found depending on the abilities required by the tasks.

Despite the differences among specific tasks in terms of equipment, displays, response requirements, and so on, the classification system enabled an integration of results and the development of functional relationships that were otherwise obscured. Thus, classification of these experimental tasks by an abilities taxonomy improved generalizations about the effects of independent variables on vigilance performance; also, relations were revealed which had been obscured without these task classifications.

Levine, J. M., & Teichner, W. H. Development of a taxonomy of human performance: An information-theoretic approach (Technical Report 9). Silver Spring, MD: American Institutes for Research, February 1971. (NTIS No. AD-736 193)

The development and evaluation of systems for describing and classifying tasks which can improve generalization of research results about human performance is essential for organizing, communicating, and implementing these research findings. The research described in this report was undertaken to develop one such system which is based on an information processing model.

A theoretical model for task classification, generated as one of several approaches to development of a taxonomy of human performance, is presented. The model defines a task as an information transfer between a source and a receiver. It is postulated that classes of tasks are characterized by classes of constraints (restrictions on random sampling) and that these constraints can be conveniently and rationally dichotomized into those acting upon the source (input) and receiver (output) of the information. Within each class of tasks so defined, tasks are further characterized in terms of the effect of amount of redundancy upon information transmission and in terms of the relationship between input and output certainty.

A method for empirical evaluation of the model is described in terms of a twofold iterative procedure: (1) computer simulations of sampling constraints to determine the relationships between redundancy and transmitted information under a variety of constraint combinations; and (2) a series of empirical investigations using tasks which allow the experimenter to manipulate input constraints and require the subject to provide output constraints.

This information processing model for task classification has the potential of predicting performance on tasks which have not yet been researched and for hardware that is not yet built. Furthermore, integration and generalization of human performance research findings can be facilitated by this classification scheme.

Lubischew, A. A. On the use of discriminant functions in taxonomy. Biometrics, 1962, 18, 455-477.

The author's stated purpose of this paper is to touch on the following topics: (1) the determination of conditions for which the discriminant function method is most effective; (2) the graphical application of the method; (3) an attempt to extend it to the case of three species; and (4) an attempt to find a quantitative measure of similarity or dissimilarity. This paper does not aim at the exposition of all taxonomic methods, but concerns only the discriminant function of R. A. Fisher since the author considers it to be the most efficient and sensitive method.

The most effective use of discriminant functions presumes an expedient selection of characters for measurement. Such characters should possess (1) individually, a high *coefficient of discrimination*, K, relating interspecific and intraspecific variability, and (2) taken in pairs, a high intraspecific correlation, with the interspecific correlation of opposite sign.

A considerable increase of discrimination can be attained graphically. The consideration of scatter diagrams and correlation ellipses suggests a new criterion, the *rank of discrimination*, R, whose relation to K is $R = \sqrt{K/2}$.

For any two out of three species of *Chaetocnema*, a pair of discriminant functions, each based on three characters, provides excellent discrimination. Discrimination between the species used to construct the functions and the third species is less satisfactory. Corresponding coefficients in the three pairs of functions differ appreciably, but when correlation ellipses for the three pairs are plotted, the relative positions of the ellipses for the three species are the same. New pairs of functions, whose coefficients are arithmetic or geometric means of the coefficients in the separate pairs permit a clean separation of all three species in one figure.

The author concludes that the above results suggest that this method could help in the quantitative evaluation of the likeness of different taxa. If successful, this quantitative approach could be applied to problems of great theoretical interest, such as the construction of a natural system of organisms, the comparison of the tempos of evolution, and the comparisons of taxa of the same level in different groups.

McFarland, B. P. Potential uses of occupational analysis data by Air Force management engineering teams (AFHRL-TR-74-54). Brooks Air Force Base, TX: Air Force Human Resources Laboratory, July 1974. (NTIS No. AD-A000 047)

The purpose of this study was to identify and evaluate areas in which Air Force Management Engineering Teams (MET's) might benefit from occupational research data. The impetus for the study was the fact that both the Occupational Analysis Program and the Management Engineering Program are concerned primarily with task-level descriptors of time spent to perform tasks required in the Air Force. Because of the genealogy of the two programs, two separate and independent techniques had been developed to measure time and to identify tasks that are performed. The objective of the Manpower Engineering Program is to determine manpower requirements and to systematically improve the distribution and utilization of manpower resources. The function of the Occupational Analysis Program is defined as follows: The occupational survey and Air Force specialty evaluation procedures are designed to secure information for maintaining the Air Force occupational structure, for updating specialty training programs, and for determining rank-ordering of Air Force specialties based on the relative complexity of the specialty requirements.

Although the goals of the two programs are different, they are compatible. Both are primarily concerned with the efficient use of human resources, with management engineering being work center oriented and occupational analysis being personnel specialty code oriented. Both programs are tasked with developing work descriptions. The management engineering description is based on what tasks are required to perform a job, in broad task categories, while occupational analysis describes what job is being performed at a finer

task level. Both programs include time measurement as an integral part of their work measurement system. The objective of this research was to determine if the two programs are compatible during any phase of an Engineered Manpower Standard Study, and where compatibility does exist, to determine the utility of using occupational analysis data in conjunction with or in lieu of current management engineering techniques.

For this study occupational research data were provided as a supplemental input to the development of MET-engineered manpower standards for base level Data Automation. The analysis revealed that the techniques used by MET and occupational analysis yield essentially the same information. The correlation obtained between the job inventory estimates of time spent in a task and the measured time provided by MET was .79 with N = 1,784. Thus, both methodologies clearly appear to be measuring the same job performance.

Although task performance often has been referenced as a critical variable in organizational structure, this is the first effort in which task level data have been used effectively to determine needed organizational restructuring. In addition to being of assistance in the area of organizational structuring and the ability to forecast certain problem areas in the measurements at a work center, the job descriptions appear to be extremely useful in the development of work center descriptions. By using current job descriptions developed from job inventory information, the author feels that significant savings in man-hours can be realized by MET during the preliminary phase of their work.

Miller, R. B. Development of a taxonomy of human performance: Design of a systems task vocabulary (Technical Report 11). Silver Spring, MD: American Institutes for Research, March 1971. (NTIS No. AD-736 195)

Problems in developing a viable descriptive taxonomy are described. The author's previous formulation of a "functional" approach to task description and analysis is reviewed, and a useful format consisting of four major "dimensions" of description is proposed. These dimensions are discriminable task functions, task content, task environment, and level of learning.

The rationale for development of a transactional language for describing and analyzing military tasks and duties is presented together with a new systems task vocabulary created according to that rationale. A tentative set of transactionally designed "information processing" categories, based in large part on this rationale, is offered as an exhibit in the appendix of this report.

The new approach assumes that the human is an information processor. He can code one class of information into other classes of information, where the second class is symbolic of the first. Symbols, when communicated from one individual or device to another, take the form of "messages." Input reception, memory, processing, and output effectors are the concepts found useful in developing the set of terms which constitute the systems task vocabulary.

Miller, R. B. Development of a taxonomy of human performance: A user-oriented approach (Technical Report 6). Silver Spring, MD: American Institutes for Research, March 1971. (NTIS No. AD-736 190)

The major thesis of this report is that a task taxonomy should be aimed at making or converting task descriptions that will assist in identifying and using psychological information (in one form or another) for making system design and personnel subsystem decisions. Task taxonomy, therefore, is an information-getting and decision-making tool. As such, it must be evaluated as any tool is evaluated---by utilitarian criteria.

A user-oriented approach is proposed for the development of new ways of describing and analyzing tasks and duties. The author considers it essential for these taxonomies to be developed and evaluated as operational information-getting and decision-making tools for use by system designers. Man-machine system design applications of this kind of tool are described in the decision areas of system characteristics, human factors engineering, selection, and training.

Methodological proposals are made for the development of performance taxonomies in future years. The author emphasizes that a taxonomy does not consist merely of a list of names. The substance of a taxonomy consists in the definitions accompanying the names---the instructions for proper use to some potential user. There is no intrinsic rule for the minimum amount of definitional context that should accompany the classificatory name and establish it as a principle of division and of extension.

Some current laboratory research assumptions and procedures used in developing taxonomies are criticized on the grounds that they are not adequately representative of the real world and do not lead to the creation of useful tools. Specific suggestions are presented regarding a modified laboratory approach to taxonomic development. These include the following: (1) Project objectives should be defined to serve as criteria for determining the relative success of the product resulting from the effort; (2) A research strategy should be articulated which specifies priorities, policies, and criteria for further exploration or abandonment of a line of inquiry; (3) An effort should be made to differentiate what must be invented and what must be discovered; (4) Programmatic inquiry and development should have some explicit subject matter boundaries, so a universe of task discourse should be expressed; and (5) The findings of the project should be organized, leading to the implementation of design recommendations.

Nafziger, D. H., & Helms, S. T. Cluster analyses of interest inventory scales as tests of Holland's occupational classification. Journal of Applied Psychology, 1974, 59, 344-353.

This study compared Holland's occupational categories with groups of occupations that resulted from the application of McQuitty's iterative intercolumnar correlational analysis to the scales of the Strong Vocational Interest Blank (SVIB), the Minnesota Vocational Interest Inventory (MVII), and the

Kuder Occupational Interest Survey (OIS) for men and women. Holland's classification contains six main categories---Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C)---and 72 subcategories within the main categories, such as Realistic-Investigative-Enterprising (RIE), Realistic-Investigative-Social (RIS), and so forth. All occupational categories were derived from a single set of coordinating definitions, six scale scores from the Vocational Preference Inventory (VPI).

A hexagonal ordering of the six types based on intercorrelations of the VPI scales has been proposed by Holland and his colleagues. The results of this study indicated that clusters of occupations exist that are internally consistent, and these clusters usually agreed with the groups of occupations in Holland's classification. The hierarchical structure of the clusters followed the hexagonal ordering of Holland's occupational categories suggested in earlier studies. In addition, the usefulness of all three letters in Holland's occupational classification was supported.

Phalen, W. J. Comprehensive occupational data analysis programs (CODAP): Ordering of hierarchically grouped case data (KPATH) and print KPATH (PRKPTH) programs (Report No. AFHRL-TR-75-32). Brooks Air Force Base, TX: Air Force Human Resources Laboratory, August 1975. (NTIS No. AD-A016 724)

When cases have been grouped hierarchically on similarity of work performed, as reported in a job inventory, the background and task data for each case in any one of the hierarchical groups can be placed in proximity to that of other cases in the group by the Ordering of Hierarchically Grouped Case Data (KPATH) program. Such a reordering of case data permits identification of background variables having similar values for all or most cases in the group, and it enables the generation of composite job descriptions for any hierarchical group, since the case data are in a readily accessible sequence.

While understanding of the overall purpose of the KPATH program is not particularly difficult, the mechanics of the program and its applications as an analytical tool are not so easily visualized without some degree of familiarity with distinct CODAP programs which help produce the input to KPATH or which use its output. Since previous technical reports deal with these associated programs, they are not discussed in detail in this report. However, the relationship of each of the programs to KPATH is stated briefly, and reference is made to the report which discusses the program in depth.

Description of the KPATH program occupies the first part of this report; the second topic discussed is the Print KPATH (PRKPTH) program, which produces a printed report of case data elements for any selected background variables from an input-ordered or KPATH-ordered history data tape. In addition, a brief description of each program is provided in Appendix A for the convenience of the reader. Appendix B is intended as a handy glossary of terms which describe the functional elements of the KPATH program (e.g., "hierarchical grouping").

Powers, T. P. Selecting presentation modes according to personnel characteristics and the nature of job tasks - Part I: Job tasks. Baltimore, MD: University of Maryland Baltimore County, January 1977.

The overall purpose of this research is to investigate a relationship among Navy personnel characteristics, job tasks, and presentation modes. Four principal endeavors are involved: identifying generic job tasks, personnel characteristics, presentation modes, and developing a decision-making model for selecting presentation modes according to personnel aptitudes and job task categories. This report deals with the generic behaviors involved in technical job task performance, that is, those categories of job tasks which are common to all or most of the technical Navy ratings and which usually require technical data presentation for their performance. The report is divided into three parts: (1) civilian and military efforts in developing behavioral definitions of job task performance, (2) survey work conducted at Navy training/fleet sites to identify common categories of job tasks, and (3) a tentative taxonomy of generic job tasks performed through the use of technical data.

Under behavioral descriptions of job task performance, the civilian efforts described are B. S. Bloom's taxonomy of educational objectives in the cognitive domain, D. R. Krathwohl et al.'s taxonomy of the affective domain, and A. J. Harrow's taxonomy of the psychomotor domain. Also discussed are R. M. Gagné's eight types of learning, and P. M. Willis and R. O. Peterson's 19 task/behavior categories as generic operational behaviors for using training devices. Additionally listed are J. A. Aagard and R. Braby's 11 types of elemental learning tasks for which learning guidelines and algorithms can be utilized in creating an instructional delivery system. The following task analysis programs in the Armed Services are reviewed: the Air Force Occupational Research Project, the Army's task analysis program, the Marine Corps' task analysis program, the U.S. Coast Guard's occupational analysis program, and the Navy's occupational task analysis program (NOTAP) and personnel qualification standards (PQS) program. An appendix to this report contains an annotated bibliography of 85 works pertaining to such efforts.

The report also describes a survey conducted of enlisted personnel assigned to a cross-section of technical ratings toward identifying the generic characteristics of Navy technical job tasks. Development and finalization of the survey instrument is described, and the findings are presented.

The final section of the report provides hypothetical descriptions of the conditions of job task performance, the in-the-head/in-the-book distribution of knowledge/skill elements, and a taxonomy of generic job tasks performed in conjunction with the use of technical data. It was tentatively concluded that seven main job task categories are valid descriptions of technical tasks which are generic to Navy technical ratings. These categories are the following: operate/secure, test/inspect, adjust/align, troubleshoot/repair, clean/lubricate, remove/replace, and assemble/disassemble. It also was concluded that 32 elements are representative of the main knowledge and skill factors subsumed by these generic job tasks. It was possible to group the 32 knowledge/skill elements so as to form useful classifications. Six classifications were constructed, and they represent hypothetical descriptions of the range of information required to perform technical job tasks. The six information classifications are listed below:

1. Basic: Nomenclature, terms, codes, jargon, etc. in an occupational specialty, as well as fundamental facts, names, location, etc. related to parts and components of equipment/hardware; meanings of technical symbols, visual cues, signals, abstract terms, etc.

2. Conjoint: Operational principles, functions, relationships, etc. of parts and components of equipment/hardware systems.

3. Operational: Operating steps for simple/basic and complex/special hand tools, testing equipment, and principal equipment/hardware.

4. Procedural: Simple/basic and complex/special rules and procedures for assembling, disassembling, troubleshooting, aligning, etc.

5. Multifactual: Lists, tables, etc. containing specific technical data, including descriptive information on calibration, settings, etc.

6. Configurative: Visual representations of functional/operational processes.

The approximate order in which the above classifications appear would seem to define lowest-to-highest requirements for technical information presentation. That is, the probability of technical information being recalled from memory is greatest for basic and conjoint classifications, while multifactual and configurative classifications have the highest requirement for information presentation at the time of job task performance.

By combining appropriate portions of three levels of cognitive performance with the six information classifications, it is possible to construct a hypothetical list of cognitive tasks involving the use of technical data. More specifically, such a list can be regarded as a tentative taxonomy of generic cognitive behaviors for technical job tasks. In the tentative taxonomy, the six information classifications are placed on two continua, one dealing with the tendency to rely on recall (in the head) and the other dealing with the tendency to rely on recognition (in the book).

Reed, L. E. Advances in the use of computers for handling human factors task data (AMRL-TR-67-16). Wright-Patterson Air Force Base, OH: Aerospace Medical Research Laboratories, April 1967.

The purpose of this paper is to review some of the data problems the task analyst must deal with in his work and to suggest some possible remedies. Task analysis procedures are reviewed, followed by a discussion of the uses of task analysis in system development programs. Problems connected with each were used to generate the goals of a research program, discussed last. This research program is directed toward the development of computerized techniques to assist the analyst make better use of available data.

The author concludes that while task analysis as a process in system development has remained relatively stable, task analysis procedures have been, and still remain, in a state of flux. To date, no generally accepted techniques have been developed for (1) conducting task analysis, (2) formatting task analysis data, and (3) classifying task information. This situation is further complicated because the technical terms used to describe human behavior remain ill-defined. Attempts to structure task analysis have met with resistance from potential users. Most analysts believe that task analysis procedures, formats, and data content are not generalizable from problem to problem but must be tailored to the needs of the system development program.

The relative simplicity of early systems was such that human requirements (skills) were easily interchanged within and between systems. Current complex aerosystems are accompanied by an increased need for closer consideration of the human component. The amounts of information generated and the compressed developmental schedules have led the specialist to rely heavily on his own expertise when existing data are not known to exist or are inaccessible. As such, the input to early identification of requirements and the integration of these requirements into training programs has suffered.

In 1963, the Aerospace Medical Research Laboratories and the National Aeronautics and Space Administration initiated a joint research program to explore and, where possible, develop techniques for handling and processing human factors task data. The first step in the research program was to generate specific problem areas to be explored, namely, (1) data analysis and classification schemes, (2) taxonomic concepts for vocabulary and thesaurus construction, (3) computer storage and retrieval, (4) analytic and simulation modeling, and (5) current awareness techniques.

The research described in this paper addresses the feasibility of using automatic computer techniques to help solve some of the data problems confronting the task analyst and the users of task analysis data. The research is based on the assumption that a user-oriented data management system will alleviate one of the main problems confronting human factors specialists, namely, that of data accessibility. A continuation of this research will be directed to the development of a small-scale pilot study which will involve realistic situations in order to validate selected computer techniques for handling data. A test data base, composed of real system data, will be used to run "live" queries. Human factors specialists engaged in current aerospace system development programs will be used to formulate queries. This approach will provide objective evaluation for establishing the feasibility of an operational system capability.

Riccobono, J. A., & Cunningham, J. W. Work dimensions derived through systematic job analysis: A replicated study of the Occupation Analysis Inventory (Research Monograph No. 9). Raleigh, NC: North Carolina State University, Center for Occupational Education, 1971. (JSAS Ms. No. 807)

In a previous study, work dimensions (factors) were derived from ratings of a representative sample of approximately 400 jobs on the Occupation Analysis Inventory (OAI). The OAI contained 622 work elements describing various types of work activities and conditions. A follow-up to this study is reported in this monograph.

The first objective of the follow-up study was to determine the stability of the originally derived factor structure through a replication of the original factor analyses with a new sample of approximately 400 jobs. The second and third objectives involved the derivation of first- and higher-order factors, respectively, from the OAI ratings of a combined sample of 814 jobs. Evidence of factorial stability was obtained through factor comparisons across the two samples using Tucker's coefficient of congruence. The results of these analyses (though comparable to those obtained in a previous study employing a similar instrument and similar procedures) were not as favorable as expected. It was noted, however, that the factors derived from a combined sample of 814 jobs were likely to be more stable than those obtained from the two smaller samples.

Factor analyses employing OAI ratings of the total sample of 814 jobs were performed on seven separate sections of OAI work elements. These seven analyses yielded 88 interpretable factors. The first-order factors then were subjected to a factor analysis which produced 22 interpretable higher-order factors. The factors obtained in this study are subject to a different interpretation than the factors obtained in the earlier study in which OAI work elements were intercorrelated on the basis of estimated attribute-requirement profiles. The implications of this difference are discussed.

Riccobono, J. A., & Cunningham, J. W. Work dimensions derived through systematic job analysis: A study of the Occupation Analysis Inventory (Research Monograph No. 8). Raleigh, NC: North Carolina State University, Center for Occupational Education, 1971. (JSAS Ms. No. 806)

One phase of a broader research project is reported in this monograph. The project was designed to develop and test an Occupation Analysis Inventory (OAI) that contained 622 work elements (items) describing various kinds of work activities and conditions. The purpose of this study was to derive a comprehensive set of work dimensions (factors) that could be used in describing, comparing, and classifying jobs and occupations for educational and guidance purposes.

A sample of 400 jobs representing the percentages of jobs in the major occupational categories of the *Dictionary of Occupational Titles* was rated on the OAI work elements. Two sets of OAI ratings were obtained on a subsample of 134 jobs for reliability purposes. Seven separate factor analyses were

performed on groups of items (work elements) contained in the following sections of the OAI: (1) information received, (2) mental activities, (3) physical work behavior, (4) representational work behavior, (5) interpersonal work behavior, (6) work goals, and (7) work context.

The item reliabilities were adequate, and the results of the seven sectional factor analyses were generally meaningful. Of the 81 factors emerging from these analyses, 77 were interpreted. Although some potential applications of the OAI factors are discussed, both the stability and utility of these dimensions remain to be demonstrated.

Riccobono, J. A., Cunningham, J. W., & Boese, R. R. Clusters of occupations based on systematically derived work dimensions: An exploratory study (Ergometric Research and Development Series Report No. 10). Raleigh, NC: North Carolina State University, Center for Occupational Education, 1974. (JSAS Ms. No. 1150)

In a previous study, a set of basic work dimensions was derived through factor analyses of job ratings on the Occupation Analysis Inventory (OAI) containing 622 work elements describing different kinds of work activities and conditions. The study reported here explored the feasibility of deriving an educationally relevant occupational cluster structure based on the OAI work dimensions. Pursuant to that purpose, a hierarchical cluster analysis was applied to the factor score profiles of 814 occupations on 22 higher-order OAI work dimensions. From that analysis, 73 occupational clusters were identified and interpreted. Although these clusters were for the most part individually meaningful, the desired hierarchical pattern of clustering (i.e., broad, general occupational clusters subsuming clusters that are narrower in scope) did not emerge in an interpretable form, and 155 of the 814 occupations in the sample failed to cluster in a logical manner at any stage of the hierarchical process. Several factors are considered that may have attenuated the clarity of the hierarchical structure. Based on these considerations, a second, larger study has been initiated in an effort to derive an OAI-based occupational cluster structure applicable to occupationally related education and guidance.

Ruspini, E. H. Numerical methods for fuzzy clustering. Information Sciences, 1970, 2, 319-350.

The concept of fuzzy set is especially attractive in clustering. Here, the problem is to group a finite number of objects, usually represented as real vectors, in a number of sets so that similar objects are grouped together, and in different sets from objects dissimilar to them. This implies the existence of a similarity or distance function defined in the data. Classification in fuzzy sets offers special advantages over conventional clustering. While capable of conventional classifications, fuzzy clustering also allows representation of troublesome points: strays, bridges, and undetermined points as such.

Section 2 of this paper defines some concepts of fuzzy clustering. Classification in fuzzy sets is presented as the breakdown of the probability density function of the given data set into a weighted sum of the probability densities of the component clusters. These densities are interpreted to represent the degree of belongingness of each point to each cluster.

As a possible technique for decomposing the data set density function in clusters, the minimization of a meaningful functional defined over all possible fuzzy classifications was suggested in an earlier paper. Several possible forms of such functions also were presented. This paper is concerned with the numerical work and experiments related to those minimizations. Section 3 presents some results on the iterative gradient methods used in the following sections. Section 4 deals with two forms of functionals that provide poor fuzzy clusterings but find acceptable starting points for using the functional defined in Section 5. The minimization of this functional is a much slower process, needing a good initial approximation to allow computation in a reasonable time. Results are excellent for dichotomies and, although the present formulation fails for partitions in more than two fuzzy sets, a simple modification is suggested for solving this problem.

Shaw, J. B., DeNisi, A. S., & McCormick, E. J. Cluster analysis of jobs based on a revised set of job dimensions from the Position Analysis Questionnaire (PAQ) (Report No. 3). West Lafayette, IN: Purdue University, Department of Psychological Sciences, April 1977.

This study deals with the cluster analysis of a sample of jobs based on data from the Position Analysis Questionnaire (PAQ). The PAQ is a structured job analysis questionnaire that provides for the analysis of various types of jobs in terms of 187 job elements of a "worker-oriented" nature. In carrying out this cluster analysis the intent was to derive clusters or job families that might be used in a later phase of the research program, in which the PAQ was to be used as the basis for the estimation of aptitude requirements for jobs. The clusters in question were to be based on scores in principal components resulting from a series of principal components analyses of PAQ data. The principal components are referred to as job dimensions.

A previous study involving the use of the PAQ in two cluster analyses of jobs had been carried out in which job dimension scores for jobs in the samples in question were also used as the basis for the cluster analyses. The job dimensions used in that study had been derived from an earlier series of principal components analyses of PAQ data. Since the time that these two cluster analyses were carried out, however, data based on the PAQ have been subjected to another series of principal components analyses, with the derivation of a new set of principal components. This newly developed set of job dimensions is considered to represent a somewhat more definitive reflection of the structure of jobs, and thus it is this set of job dimensions that will be used instead in the later phases of the current research program. Under the circumstances, a cluster analysis based on these new job dimensions was carried out. The study dealt with in this report is concerned with results of that cluster analysis.

The principal components analyses used in this study were those derived from the use of a sample of 2,200 jobs. Those jobs were considered to be reasonably representative of jobs in the labor force in terms of major occupational groups. For the purpose of the cluster analysis, a sample of about one-third of those 2,200 jobs was selected (746 to be exact).

The cluster analysis was carried out with the hierarchical grouping technique developed by Ward (1961) and by Ward and Hook (1963). The cluster analysis procedure involved is of an iterative nature. In this instance, the procedure would consist of starting with 746 job groups, with one job in each group. This procedure requires that a decision be made as to the number of clusters which would best serve the purposes in mind. Since there are no particularly satisfactory guidelines for use in selecting the iteration at which to stop (this decision in effect being one that determines the number of clusters to recognize), it was decided to select three stages in the iterative process, these being the ones at which 60, 40, and 20 clusters were formed. This decision was made in order later to be able to compare the predictability of aptitude requirements of individual jobs based on those for their job families, representing the three "levels" of homogeneity characterized by the three sets of clusters of 60, 40, and 20 jobs, respectively.

Silverman, J. New techniques in task analysis (SRM 68-12). San Diego: U.S. Naval Personnel Research Activity, November 1967. (NTIS No. AD-663 135)

This research was directed toward the investigation of recent developments in techniques of task analysis. Because of methodological problems associated with the development of training curricula, the analysis of man-machine systems, and occupational analysis, it has been proposed that a task taxonomy be developed. Such a taxonomy would indicate the inherent similarities between tasks, independent of their environment, and pave the way for improvements in training, billet structure developments, and improved manpower utilization.

It has been proposed that research be performed to systematically classify tasks in terms of critical generalizable variables, characteristics, and attributes inherent in the task---independent of the setting or environment of the task. By classifying the behaviors required in performing a task, and training personnel in the basic abilities implied by those behaviors (rather than the specific technical elements in a task), it is contended that curricula may be made more realistic in terms of task demands. Also, a task analysis based on selected categories or dimensions of task behavior provides a breakthrough by eliminating the necessity for repeatedly developing and analyzing long, detailed task lists or inventories. A set of such categories of task behavior has been called a taxonomy.

A taxonomy involves the systematic differentiation, ordering, relating, and naming of type groups within a subject field. In these terms, the classification of naval ships is a kind of taxonomy wherein ships are grouped by class, type, and overall purpose. Similarly, tasks may be ordered into

groups on the basis of their relationships, and distinctive names or nomenclature may be applied to those groups.

The taxonomic process involves the following steps:

1. Collecting samples of phenomena.
2. Describing essential features or elements.
3. Comparing phenomena for similarities and differences.
4. Developing a set of principles governing the choice and relative importance of elements.
5. Grouping phenomena on the basis of essential elements into more and more exclusive categories and naming the categories.
6. Developing keys and devices as a means of recognizing and identifying phenomena.

There have been many attempts at developing taxonomies based on the common behavioral elements in tasks. Few of these have been the result of the systematic taxonomic process described above. Some efforts have been empirical---relying on correlations of task behaviors or learning demands, and then factor analyzed to determine the behavioral categories or dimensions underlying the subject tasks. Others have employed an "arm-chair" approach based on accumulated research experience. An appendix is included in this paper which contains a number of examples of task taxonomies, developed for different purposes and employing different techniques.

Problems of task classification can be approached more systematically through methods of numerical taxonomy than through traditional techniques. Numerical taxonomy places the procedures of task comparison and classification on an operational and quantitative basis. This makes it possible for the Navy to objectively and precisely evaluate its billet and rating structure. It was concluded that the application of techniques of numerical taxonomy to problems of task analysis is warranted because of its usefulness in helping to solve problems relating to the Navy's personnel systems.

Sneath, P. H. A. The application of computers to taxonomy. The Journal of General Microbiology, 1957, 17, 201-226.

At the outset of the paper, the author reiterates four main conclusions reached in an earlier discussion. First, that the ideal classification is the one which has the greatest content of information. Secondly, that overall similarity is the basic concept of such ideal classifications and that it is measured in terms of the number of similar features possessed by two organisms. Thirdly, that every feature should have equal weight. Fourthly, that division into taxonomic groups is made upon correlated features. Classifications based on the last three principles will contain the greatest content of information.

A development of these principles is that overall similarity may be estimated numerically, and in this paper an attempt is made to do this by

using an electronic computer, and to suggest how overall similarity might be used as a criterion of taxonomic rank. The first step is to convert one's data into a table of features which are scored as present or absent; for this the term 'feature' must be defined and a method of scoring devised. Secondly, the table must be analyzed so as to give a numerical value for overall similarity.

If one considers an individual as possessing a very large number of features, one could divide the features of two such individuals into three classes: (a) those features possessed by the first but not by the second individual, (b) those possessed by both individuals, and (c) those possessed by the second but not by the first individual. Then the numbers in the classes could be counted. In this model every feature has equal weight. Similarity, then, is defined as follows:

S = Similarity, and is n_s/n_f, where

n_s = the number of positive features possessed by both individuals. It does not include the number of features which are not possessed by either individual.

n_d = the number of features possessed by the first individual but not by the second plus the number possessed by the second but not by the first.

$n_f = n_s + n_d$.

The symbol S may be given as a decimal fraction or as a percentage. S also stands for Mean Similarity when it refers to groups of individuals.

An example of this method in bacteria is given, and the results are compared with the conventional classification. The method is to count the number of similar and of dissimilar features between strains and to sort the strains into groups whose members have a high percentage of similarities. The author states that the example given in this paper may not be a very good test of the method since sharply defined groups of bacteria were used, and the least one would expect is that the method should separate them. The example does, however, suggest that the method does not disrupt sound taxa.

Sneath, P. H. A. Some thoughts on bacterial classification. The Journal of General Microbiology, 1957, 17, 184-200.

A classification is greatly influenced by the purpose for which it is devised. The author considers two purposes of classification: (1) to give names or numbers to things, which is better called enumeration or cataloguing; and (2) to indicate similarity, and thus to increase one's ability to think about and to use observational material. The underlying assumption of scientific classification is that there is a natural order, a system of similarities, which can be discovered by investigation.

Scientific classification is virtually a branch of mathematics which describes the overall similarities of organisms. Catalogues do not do this. Many schemes of bacterial taxonomy are not classifications but catalogues. Similarity is best measured by the number of features in common between two strains, while division into taxa is based on correlated features. The author's position is that there seems to be no logical reson why any one feature should be given greater weight in classification than any other. He concludes that it is not necessary to know the evolutionary history of organisms in order to classify them in a scientific manner.

Hierarchical systems are discussed as a practical necessity, and simple mathematical methods are considered useful in bacterial classification. A justification for introducing mathematics into bacteriological classification may be needed. The author points out that mathematics and statistics already are firmly entrenched in areas such as viable counting, but that they may seem foreign to the taxonomist. He cites the impact of mathematics on the definition of blood groups as a case in point. At first this field must have seemed to be a very non-mathematical subject, but the use of mathematical and statistical methods has caused an enormous expansion of valuable conclusions and of profitable experimentation.

Sneath, P. H. A., & Sokal, R. R. Numerical taxonomy: The principles and practice of numerical classification. San Francisco: W. H. Freeman & Co., 1973.

Numerical taxonomy is the grouping of units (generally biological organisms) into classes or taxa on the basis of their characters. The stated purpose of this book is fourfold: (1) to present an up-to-date theoretical basis for numerical taxonomy, (2) to acquaint readers with its procedures, (3) to illustrate its advantages over conventional taxonomy, and (4) to report on the status of the field so far.

The appropriate biological basis for taxonomic classification is the subject of much controversy among biologists. The authors opt for a system based on phenetic relationships (resemblances of characters presently observable) which produces phenetic classifications, as opposed to systems based on phenetic and phylogenetic relationships (which sometimes must be inferred) which produce cladistic (evolutionary branching) classifications. Numerical taxonomy generally involves the measurement of a large number of characters and the computer processing of these measurements using a variety of statistical procedures. Such an approach is viewed skeptically by many biologists (and statisticians). The authors present arguments in favor of their opinions and refute opposing criticisms in light of these positions.

Selection of characters for analysis is discussed in a chapter entitled, *Taxonomic Evidence*. General principles are elucidated, and arguments in favor of equal weighting for characters are presented.

The construction of similarity coefficients and their use in deriving taxonomic classifications is the subject of two chapters. Various types of correlations and association coefficients are described along with a full

range of clustering techniques. General ideas are presented; but for the reader desiring adequate insight into the capabilities and limitations of these statistical and pseudostatistical methods, investigation of the references would be necessary.

Later chapters deal with phylogeny, population phenetics, identification and discrimination, implications for nomenclature, criticisms of numerical taxonomy, applications to other fields, and the future of systematics. A 60-page bibliography is provided. Both author and subject indexes are included.

Stevens, S. S. Measurement, statistics, and the schemapiric view. Science, August 1968, 161, 849-856.

Back in the days when measurement meant mainly counting, and statistics meant mainly the inventory of the state, the simple descriptive procedures of enumeration and averaging occasioned minimum conflict between measurement and statistics. But as measurement pushed on into novel behavioral domains, and statistics turned to the formalizing of stochastic models, the one-time intimate relation between the two activities dissolved into occasional misunderstanding. Measurement and statistics must live in peace, however, for both must participate in the schemapiric enterprise by which the schematic model is made to map the empirical observation.

Science presents itself as a two-faced, bipartite endeavor looking at once toward the formal, analytic, schematic features of model-building, and toward the concrete, empirical, experiential observations by which we test the usefulness of a particular representation. Schematics and empirics are both essential to science, and full understanding demands that we know which is which.

Measurement provides the numbers that enter the statistical table. But the numbers that issue from measurements have strings attached, for they carry the imprint of the operations by which they were obtained. Some transformations on the numbers will leave intact the information gained by the measurements; other transformations will destroy the desired isomorphism between the measurement scale and the property assessed. Scales of measurement therefore find a useful classification on the basis of a principle of invariance: each of the common scale types (nominal, ordinal, interval, and ratio) is defined by a group of transformations that leaves a particular isomorphism unimpaired.

Since the transformations allowed by a given scale type will alter the numbers that enter into a statistical procedure, the procedure ought properly to be one that can withstand that particular kind of number alteration. Therein lies the primacy of measurement: it sets bounds on the appropriateness of statistical operations. The widespread use on ordinal scales of statistics appropriate only to interval or ratio scales can be said to violate a technical canon, but in many instances the outcome has demonstrable utility. A few workers have begun to assess the degree of risk entailed by the use of statistics that do not remain invariant under the permissible scale transformations.

The view is proposed that measurement can be most liberally construed as the process of matching elements of one domain to those of another domain. In most kinds of measurement we match numbers to objects or events, but other matchings have been found to serve a useful purpose. The cross-modality matching of one sensory continuum to another has shown that sensory intensity increases as the stimulus intensity raised to a power. The generality of that finding supports a psychophysical law expressible as a simple invariance: equal stimulus ratios produce equal sensation ratios.

Stolurow, L. M. A taxonomy of learning task characteristics (AMRL-TDR-64-2). Wright-Patterson Air Force Base, OH: Aerospace Medical Research Laboratories, January 1964. (NTIS No. AD-433 199)

The design of efficient training environments requires the selective uses of research findings from basic studies of learning. Decisions about the use of particular principles of learning are constantly required in the development of new training materials, systems, devices, and aids. Consequently, there is a critical need for a system of classifying learning tasks which will permit training specialists to make efficient use of principles of learning. This report is designed to assist a training specialist in the design and development of effective training programs in support of Air Force positions. It presents a system for classifying learning tasks which was developed under this contract for the purpose indicated. The data used in developing a tentative taxonomy of learning tasks were the findings reported in the literature.

The project proceeded by formulating hypotheses about a useful set of task variables and then testing them through an examination of the literature. Testing consisted in the examination of studies to check the applicability of the proposed characteristic. This procedure led to many revisions of the set of task variables and their definitions.

One study was an additional pragmatic check on the proposed system. For this purpose personnel who might use the classification system were selected. All had Ph.D. degrees in psychology. Each was asked both to code descriptions of tasks contained in published literature on learning and to decode a set of coded tasks which were prepared for this purpose. These coding and decoding trials resulted in a final revision of the definitions of the proposed task characteristics.

In the taxonomy proposed, a provisional set of critical learning task characteristics are given that are represented in terms of input, output, and relationship. For this approach to task classification, task-relevant information is that which relates to particular characteristics of (1) the stimuli that are to be cues, (2) the responses that these cues are to elicit, and (3) the relationships to be formed between cue stimuli and response. Task descriptions, then, are those statements about a learning situation that specify the critical cue, response, and cue-response relationships that will be the performance standards for decisions about reinforcement.

The research and analytical procedures used in this project are summarized in this report, along with the findings produced by a tryout of the system with a group of training specialists. The author suggests that this report be used as the basis for preparing a manual to be employed by personnel making training decisions and tried out with them to make it a guide for the use of the taxonomic system with descriptions of jobs. Another type of needed work indicated by this effort is the systematic working out of the set of relationships between each task characteristic and the applicable learning principles.

Teichner, W. H., & Whitehead, J. Development of a taxonomy of human performance: Evaluation of a task classification system for generalizing research findings from a data base (Technical Report 8). Silver Spring, MD: American Institutes for Research, April 1971. (NTIS No. AD-736 192)

The research reported in this paper was undertaken to assess the feasibility of constructing a data base founded on a "criterion measure" task classification system, which could improve generalization of research results about human performance. Some early findings in applying one task classification system to a portion of the existing literature on learning and environmental effects are reported. The two learning variables investigated were "optimum distribution of practice," and "knowledge of results"; the environmental factor investigated was "the effects of different noise intensities."

A "criterion measure" task classification system was applied to a portion of the existing literature on learning and environmental variables. The literature base to which the classfication system was applied consisted of three sets of experimental reports from the scientific literature included in the human performance data base developed in the project.

It was shown that for certain variables and certain task conditions the categorization system was effective in predicting human performance across a variety of tasks. With the system it was possible to organize the literature on distributed practice in terms of (1) functional relationships, and (2) different functions for different task categories.

Theologus, G. C. Development of a taxonomy of human performance: A review of biological taxonomy and classification (Technical Report No. 3). Silver Spring, MD: American Institutes for Research, December 1969. (NTIS No. AD-705 255)

This review of systematic biology was undertaken to determine whether any of the concepts and methods from systematic biology could be applied to the problems of task taxonomy and task classification. Although the review found that biology could not supply ready solutions to problems in the classification of tasks, certain taxonomic concepts were extracted which should be of value.

One of the more important points noted by the author is that a taxonomy is a prerequisite for classification. That is, the organization of tasks, or of any subject matter, into groups requires the previous development of a sound logic and rationale for the organization. Without a well-developed taxonomy, classification generally is a futile effort.

In developing the rationale for a classification, the following questions must be considered: (1) Why do you want to classify, (2) What will you classify, and (3) How will you classify? Not only is it essential to consider these questions, but they must be considered in that order. In other words, the subject matter of the classification and the related classificatory procedures are dependent upon the purpose of the classification.

The consideration of the purpose of classification leads to the definition of three types of classifications, each with its particular attributes, uses, and limitations. Although it appears to be of little scientific interest to psychology, a teleological classification of tasks can be developed in order to group tasks on the basis of their usefulness with respect to man. Consociative classifications of tasks can be developed if the purpose of classification is to relate tasks to variables of interest which are not inherent attributes or characteristics of the tasks themselves, such as inferred processes in the operator or principles of learning. The third type of classification, theoretical classification, describes tasks in terms of the inherent attributes and characteristics of the tasks. Since they are the only classificatory vehicles which possess a high content of information concerning the tasks as tasks, they are the only classifications of tasks which can relate essential information concerning the tasks themselves to sets of exoteric variables.

Three approaches to the development of theoretical classification also were considered. Linnaean taxonomy which employs scholastic logic to develop classifications and Darwinian taxonomy which employs a deductive theory were rejected for use in task classification on the basis of their vulnerability to criticism. Numerical taxonomy, the most empirical of the three biological approaches to classification, was found to provide a sound basis for the development of classificatory systems and was suggested as a model for the development of task classifications.

Theologus, G. C., & Fleishman, E. A. Development of a taxonomy of human performance: Validation study of ability scales for classifying human tasks (Technical Report 10). Silver Spring, MD: American Institutes for Research, April 1971. (NTIS No. AD-736 194)

This report is the second of a series of studies designed to explore the feasibility of an approach to the development of a comprehensive taxonomy of tasks based on the use of known parameters of human performance for describing and classifying tasks. The first report described the development of human-ability-based rating scales and presented data on their reliability.

A panel of nine judges was asked to rate each of 38 tasks in terms of an instrument called the Task Assessment Scales. This instrument allowed each task to be rated on a set of 35 scales representing different human ability requirements. These data were subjected to two separate analyses. First, coefficients of correlation and similarity were used to examine the relationship between selected ability scales and empirically derived ability factors which they were designed to represent. This analysis provided an estimate of the construct validity of the scales. Second, the judges' ratings of the tasks on the ability scales were used to predict performance on those tasks. Mean performance data on the tasks were obtained from an earlier factor-analytic study utilizing these tasks. A multiple regression technique was used to determine the predictive relationship which existed between the ability ratings and performance on the tasks.

In general, it was found that the ability scales possessed substantial construct and predictive validity. The task ratings on the eight scales which were assessed for construct validity were significantly correlated with the factor loadings for these same tasks on factors which corresponded to these scales. Further, a multiple regression equation was generated which indicated that a set of three ability scales was significantly related ($R = .64$, $p < .01$) to performance on the tasks which were rated.

Coupled with the results of the first study in this series, the results indicate that an approach to the development of a taxonomy of human performance founded on human-ability-based rating scales can provide a reliable and valid means for describing, classifying, and predicting human performance on a variety of tasks.

Theologus, G. C., Romashko, T., & Fleishman, E. A. Development of a taxonomy of human performance: A feasibility study of ability dimensions for classifying human tasks (Technical Report 5). Silver Spring, MD: American Institutes for Research, January 1970. (NTIS No. AD-705 672)

A major problem which confronts the behavioral sciences is the lack of a unifying set of dimensions for describing human task performance. The absence of such a system limits the ability to relate human performance observed in one task to that observed in similar tasks. There is a need for a well-defined task-descriptive language for use by those who must apply the results of research to operational tasks.

This report describes one of several approaches under development as part of a larger program; the approach is concerned with developing a task classification system based on known parameters of human performance. The human abilities, on which this system was based, were derived primarily from the reported factor analyses of human performance in the cognitive, psychomotor, physical, perceptual, and sensory areas. Definitions of the abilities were developed together with rating scales for each ability. A series of pilot studies then were undertaken with the objective of producing an instrument which would have high reliability in classifying human tasks. During these exploratory studies, the initial set of human abilities was modified,

the definitions of the abilities were revised, and the rating technique was improved. In addition, the studies examined various methods of analyzing the reliability data, and compared two methods of anchoring the rating scales.

The results of this pilot research indicated that it was possible to develop a set of reliable, ability-based scales for classifying tasks, although more work will be needed. Future research on a human ability approach to classification will continue with the investigation of the problems of scale reliability and will initiate research on questions of the validity of the classificatory instrument.

Van Emden, M. H. An analysis of complexity (Mathematical Centre Tracts 35). Amsterdam: Mathematical Centre, 1971.

Numerous methods have been proposed for using a computer for the classification of objects. If all methods give substantially the same classification, there is the theoretical problem of explaining this. If they give different classifications, there is the practical problem of deciding which of these, if any, gives a "good" classification. If a "good" classification means that it should be "meaningful" or that it should "explain as much as possible," the problem is caused by the difficulty of bridging with mathematical reasoning the gap between criteria of this form and an algorithm suitable for execution by computer.

When attempting to solve a large system of equations, the problem of classification arises in such a way that the criterion for a good classification can be formulated precisely. It is also naturally expressed in terms of the "complexity" of a system if this is interpreted to be the totality of interactions within it. This suggests that the phenomenon of complexity is worthy of being studied in its own right and that it provides a conceptual foundation for classification.

In Chapter I a mathematical definition of complexity based on a definition of interaction in terms of the theory of information is proposed. In Chapter 2 the analysis of qualitative data is discussed. Pairwise interactions between entities to be classified may be used to define a distance function without, however, supposing that the qualitative data themselves constitute a metric space. This allows a model of classification to be formulated in terms of information and to discuss its relation to clustering.

In Chapter 3 data are discussed that describe objects that can be represented by points in n-dimensional inner-product space, and the covariance matrix of the set of points is studied. The several criteria, according to which the principal components approximation of multivariate statistics is optimal, are related to data compression. In connection with this, a maximum-entropy characterization of the multivariate normal distribution is given. With the aid of this characterization, a measure of the complexity of a covariance matrix is proposed, and how particular coordinate systems give special representations of complexity is studied. The condition number of the covariance matrix, a quantity which is important in numerical computation, is related to its complexity. Finally, an iterative method for solving

a system of linear equations, of which the matrix of coefficients is the covariance matrix, is treated. It is shown that, if the variables have a strong clustering in the sense of information theory, the solution by means of the iterative method is expedited if the variables are classified according to this clustering.

Wheaton, G. R. Development of a taxonomy of human performance: A review of classification systems relating to tasks and performance (Technical Report No. 1). Silver Spring, MD: American Institutes for Research, December 1968. (NTIS No. AD-689 411)

In this report, relevant literature bearing on previous taxonomic approaches and concepts in the behavioral sciences are reviewed. Primary emphasis has been placed on literature dealing with the classification of different aspects of human performance and of tasks. Approximately 50 studies and papers were selected for review.

Approaches to and dilemmas encountered in attempting to develop systems of classification are discussed. Within this context the taxonomic issues of purpose or objective of classification, descriptive bases upon which a system of classification is to be founded, and methodological approaches and analytical techniques employed to establish and validate a classification system are discussed in terms of available alternatives.

Of importance for future taxonomic efforts is a distinction among alternative classification systems in terms of their objectives. Two general types of objectives can be identified. One can attempt to relate the classification system to a particular content area for a specific application, or one can relate it to a broad range of content areas. When a specific application is intended, it often dictates the classificatory structure from the start. On the other hand, in developing classification systems designed to satisfy a much broader range of applications, direct interest initially lies in the similarity of characteristics of the subject matter to be classified. Thus, the choice is either utilitarian classification with specific applications or theoretical classification with broad applications.

Every system of classification has as its very foundation a set of terms to be employed in the description and eventual classification of the subject matter toward which the system is oriented. This report identified four approaches to defining tasks: (1) the behavior description approach, (2) the behavior requirements approach, (3) the ability requirements approach, and (4) the task characteristics approach. Thus, differential description may be based upon observed behaviors, required behaviors or processes, required abilities, or task characteristics.

Three issues arise in attempting to actually develop a classification system, given that an objective has been stated and that a conceptual basis for description has been chosen. The first is that the subject matter be classified as reliably as possible. The second issue is that classification

may proceed on qualitative or quantitative grounds. The third issue underlying classificatory procedures involves the selection and use of criteria to assess the adequacy and utility of classification.

Regardless of the characteristics in terms of which classification is to be achieved, they ideally should be defined in operational terms. The reliability with which distinctions among attributes can be made is largely a function of the extent to which they have been operationally defined. Objectivity of definition bears directly on the reliability and precision with which the selected subject matter can be classified. It is critical to both qualitative and quantitative classification systems.

As a minimum requirement, the characteristics employed in the differentiation and classification of the subject matter must permit nominal scaling. In essence, a judge is required to make a series of qualitative judgments about the presence or absence of a set of characteristics which are treated as attributes. Classification based upon this type of qualitative analysis is either monothetic or polythetic. In monothetic classification, the taxonomist defines each category in terms of a unique and usually small set of attributes such that possession of these features is both necessary and sufficient for membership in the group so defined. The groups which result are termed monothetic groups because each grouping has a unique set of defining attributes. In contrast, polythetic classifications are developed from an examination of the overall pattern of features which can be attributed to each specimen. No single attribute is either essential to group membership or is sufficient to make a particular specimen a member of the group. Classification proceeds as if a check list were being employed. Those specimens having identical or "similar" patterns of attributes are placed within the same category.

Regardless of which particular approach (monothetic or polythetic) is chosen, classification on qualitative grounds is clearly possible given a set of reasonably well-defined characteristics whose presence or absence can be reliably determined. However, no matter how classes are generated, the relationships among them cannot be determined. In other words, the similarity among classes cannot be established. Dealing with nominal data, distance functions cannot be employed to express the degree of similarity between classes. Implied is the notion that classification systems based on nominal data will contain categories which differ in kind but not in degree.

With sufficient rigor in the definition of descriptive terms, judges could be asked to rate or scale each characteristic. Were fully operational definitions available, measurement might proceed in terms of counts or in terms of quantitative dimensions. The problem of quantitative classification then becomes one of determining the degree of similarity between dimensional profiles. Those profiles having the greatest similarity would be placed within the same class. Numerical taxonomic procedures provide for the precise measurement of the similarity (distance) among the samples to be classified. This generally is accomplished by multidimensional scaling, cluster analysis, or discriminant function techniques. Each sample is located in hyperspace as a function of its values on the set of dimensions used to describe it. Those samples which are located in the same general space tend

to cluster or to fall into classes. The choice of a particular criterion for cluster size is arbitrary. However, once clusters are generated, the differences between them can be described precisely in terms of their distances from one another along each dimension of description.

No matter what the descriptive bases or the techniques employed in classification, it is essential that descriptor values be assigned reliably. Reliability of description is the sine qua non of a reliable system of classification. Other criteria typically are called into play once the formal process of classification has been initiated. Ultimately desired is a system which permits exhaustive classification and which consists of mutually exclusive categories. It is the consensus of taxonomists that these two criteria be applied liberally during initial developmental efforts. Undue emphasis on these criteria during initial efforts is viewed as overly restrictive. Taxonomists agree completely that regardless of what is classified, the system must eventually be tied to behavior or performance.

The report concludes that behavioral taxonomy is still in its infancy and that truly powerful systems of classification have yet to be developed. The paper suggests that substantive progress may be made by attempting development of a task classification system based upon numerical taxonomic procedures.

Wiley, L. N. Potential uses of the functional account code in describing job requirements (AFHRL-TR-75-53). Brooks Air Force Base, TX: Air Force Human Resources Laboratory, October 1975. (NTIS No. AD-A018 609)

A major problem in the utilization of personnel appears when one attempts to identify skills and knowledges acquired in job assignments held in the past. Lack of regular job inventorying of Air Force personnel by individuals rather than samples makes it infeasible to use job inventories to recapture a given airman's record. Present plans to broaden the use of identifiers of special skills may correct this deficiency for future airmen, but it fails to do so for the bulk of current personnel.

A possibility of using the Functional Account Code (FAC), assigned by the management engineering team (MET), was perceived, and a pilot study was performed to verify the potential. This study attempts a preliminary assessment of the FAC as a possible asset in occupational analyses. Conversely, it considers job analysis data as a possible asset to accomplishing manpower requirements evaluations.

A Functional Account Code is part of the authorization for every airman position. This 4-digit designation combines the concept of organizational level with the mission of the activity in which the position exists. Functional Account Codes are part of the manpower apportionment system of the Air Force, and they are the specific responsibility of the management engineering teams (MET's). This research was possible because a file of records on all studies clustering job inventories from 1965-1971 had just been readied, with the FAC for each airman included.

It first was shown that when individuals are sequenced by FAC, the job clustering corresponds well with the Functional Account Code; 75 Air Force Specialty Codes (AFSC's) are shown in graphic form. A more intensive analysis then was made of the Administration Specialist ladder, which contains the largest number of FAC's of any specialty, in which it was found that FAC titles agreed well with the titles assigned to job clusters by the analyst who interpreted the homogeneous grouping of the job inventories.

It was concluded that standardization of job titles could be improved greatly through the combined efforts of the management engineering teams and occupational analysis. Many local usages would prove to represent the same job with different titles if reduced to common denominators. This could lead to small extensions of the Functional Account Code as an individual work history identifier. Longitudinal analyses are planned as a follow-on.

APPENDIX B

RANK ORDER OF JOB TITLES BY FREQUENCY OF SELECTION FOR FIVE NAVY ENLISTED RATINGS

Table B-1

Rank Order of Job Titles by Frequency of Selection

for 1,507 Aviation Boatswain's Mates (AB)

Job Title	No. of AB's Selecting	Percentage of Sample	Cumulative Percentage
Crash Crewmember	113	7.50	7.50
Aircraft Handling Crewmember (Blueshirt)	82	5.40	12.90
Crash Truck Driver/Operator	63	4.20	17.10
Aircraft Director (Yellowshirt)	62	4.10	21.20
Section Leader	58	3.80	25.00
Division Leading PO	51	3.40	28.40
Division Leading Chief	50	3.30	31.70
Fueling Crewmember	46	3.05	34.75
Shop Supervisor	41	2.70	37.45
Fuel Pump Room Operator	34	2.25	39.70
Arresting Gear Maintenance PO	32	2.10	41.80
Crash and Salvage CPO/PO	32	2.10	43.90
Flight Line PO/CPO	32	2.10	46.00
Fuels Maintenance PO	32	2.10	48.10
Fuel Truck Driver/Operator	31	2.05	50.15
DCPO Damage Control PO	27	1.80	51.95
Flight Deck Fly PO	26	1.70	53.65
Flight Line Crewman	25	1.60	55.25
Flight Deck Aircraft Operator	24	1.60	56.85
Supply Petty Officer	24	1.60	58.45
Compartment Cleaner	23	1.50	59.95
Catapult Deck Edge Operator	22	1.50	61.45
Tow Tractor Driver	22	1.50	62.95
Catapult Hook-Up Safety PO	21	1.40	64.35
AG Engine Room Operator	20	1.30	65.65
Catapult Captain	20	1.30	66.95
Air Terminal PO	19	1.30	68.25
Catapult Hook-Up Man	19	1.30	69.55
Catapult Retraction Engine Operator	19	1.30	70.85
Catapult Console Operator	16	1.10	71.95
Catapult Hold Back Man	16	1.10	73.05
Fuels Flight Deck PO	16	1.10	74.15
Master-at-Arms (MAA)	16	1.10	75.25

Table B-1 (Continued)

Job Title	No. of AB's Selecting	Percentage of Sample	Cumulative Percentage
Crash Scene Leader	15	1.00	76.25
Hangar Deck Crew Leader	15	1.00	77.25
Fuel Quality Control PO	14	.90	78.15
Instructor	14	.90	79.05
Fuels Below Decks Supervisor	13	.90	79.95
Hangar Bay PO	13	.90	80.85
Police Petty Officer (PPO)	13	.90	81.75
AG Below Deck PO	12	.80	82.55
Crash Crane Driver/Operator	12	.80	83.35
Water Brake Operator	12	.80	84.15
Fuel Filter Room Operator	11	.70	84.85
Phone Talker	11	.70	85.55
Pri-Fly Controller	11	.70	86.25
Plane Captain	10	.70	86.95
Spotting Dolly Driver	10	.70	87.65
Air Terminal Crewmember	9	.60	88.25
Arresting Gear (AG) Deck Edge Operator	9	.60	88.85
Assistant Crash and Salvage PO/CPO	9	.60	89.45
Hook-Runner	9	.60	90.05
Security Policeman	9	.60	90.65
Bridle Arrestor Operator	8	.50	91.15
Capapult Console Recorder	8	.50	91.65
PMS Coordinator	8	.50	92.15
Dispatcher	7	.50	92.65
Division Officer	7	.50	93.15
Sheave Damper Operator	7	.50	93.65
Fuel Checker	6	.40	94.05
Jet Blast Deflector (JBD) Operator	6	.40	94.45
Air Terminal Duty Officer	5	.30	94.75
Catapult Center Deck Operator	5	.30	95.05
Chronograph Operator	4	.30	95.35
Weight Board Operator	4	.30	95.65
Wheels Watch	4	.30	95.95

Table B-1 (Continued)

Job Title	No. of AB's Selecting	Percentage of Sample	Cumulative Percentage
Career Counselor	3	.20	96.15
Crash Crew Maintenance PO	3	.20	96.35
Loadmaster	3	.20	96.55
Senior Enlisted Advisor	3	.20	96.75
Human Relations Representative	2	.10	96.85
LSO Platform AG Talker	2	.10	96.95
Shore Patrol	2	.10	97.05
Catapult Bow Safety Man	1	.07	97.12
Crossdeck Pendant (CDP) Checker	1	.07	97.19
Mess Cook	1	.07	97.26
Pri-Fly Recorder	1	.07	97.33
B&A Crane Operator	0	.00	97.33
Boat Coxswain	0	.00	97.33
Crash Forklift Operator	0	.00	97.33
Hangar Deck Fuels PO	0	.00	97.33
Write-In	17	1.10	98.43
Invalid Response	23	1.50	99.93
No Response	1	.07	100.00

Table B-2

Rank Order of Job Titles by Frequency of Selection

for 2,568 Aviation Machinist's Mates (AD)

Job Title	No. of AD's Selecting	Percentage of Sample	Cumulative Percentage
500 Laborer	245	9.5	9.5
Plane Captain	241	9.4	18.9
Work Center Supervisor	225	8.8	27.7
Maintenance Crewmember	214	8.3	36.0
Engine Build-Up Mechanic	145	5.6	41.6
Assistant Shop Supervisor	144	5.6	47.2
Power Plants Troubleshooter	125	4.9	52.1
Quality Assurance Representative	112	4.4	56.5
Flight Engineer	82	3.2	59.7
Maintenance Control Chief	77	3.0	62.7
Line Supervisor	73	2.8	65.5
Complete Engine Repair (CER) Crew Leader	72	2.8	68.3
Turbo-Shaft Mechanic	71	2.8	71.1
Check Crewmember	58	2.3	73.4
Line Crewmember	55	2.1	75.5
Training PO	45	1.8	77.3
Division Chief	42	1.6	78.9
Aircrew Member (Fixed Wing)	41	1.6	80.5
Administrative PO/CPO	39	1.5	82.0
Test Cell Operator	32	1.3	83.3
Tool Room PO	30	1.2	84.5
Check Crew Leader	29	1.1	85.6
Line Troubleshooter	26	1.0	86.6
Component Repair Mechanic	25	1.0	87.6
"SAR" Crewmember	24	.9	88.5
Assistant Line Supervisor	20	.8	89.3
Branch Chief	20	.8	90.1
Leading Chief	18	.7	90.8
Aircraft Division CPO	17	.7	91.5
Aircrew Member (Rotary Wing)	17	.7	92.2
Production Control PO/CPO	16	.6	92.8
Propeller Mechanic	14	.6	93.4
Ground Support Equipment (GSE) PO	11	.4	93.8
Compartment Cleaner	9	.4	94.2
Corrosion Control PO	9	.4	94.6
Loadmaster	9	.4	95.0

Table B-2 (Continued)

Job Title	No. of AD's Selecting	Percentage of Sample	Cumulative Percentage
Assistant Squadron Duty Officer (ASDO)	8	.3	95.3
Inflight Refueling Stores Mechanic	7	.3	95.6
Career Counselor	6	.2	95.8
Production Control Records Keeper	6	.2	96.0
Screening PO	6	.2	96.2
Division Officer	5	.2	96.4
Senior Enlisted Advisor	5	.2	96.6
Operations CPO/PO	4	.2	96.8
Test Flight Crewmember	4	.2	97.0
School Administrator	3	.1	97.1
Fluid Analysis Technician	2	.1	97.2
Technical Advisor	2	.1	97.3
Aircraft Condition Evaluation (ACE) Crewmember	1	.0	97.3
Flight Coordinator	1	.0	97.3
Inflight Troubleshooter	1	.0	97.3
Maintenance Management Advisory Team Member	1	.0	97.3
Material Control Chief	1	.0	97.3
Mess Cook	1	.0	97.3
Public Affairs Officer	1	.0	97.3
Test Equipment Calibration PO/CPO	1	.0	97.3
Assistant Division Officer	0	.0	97.3
Key Control PO	0	.0	97.3
Write-In	12	.5	97.8
Invalid Response	57	2.2	100.0
No Response	1	.0	100.0

Table B-3

Rank Order of Job Titles by Frequency of Selection

for 2,467 Electronics Technicians (ET)

Job Title	No. of ET's Selecting	Percentage of Sample	Cumulative Percentage
Electronics Technician	421	17.1	17.1
Radar Technician	188	7.6	24.7
Communications Technician	185	7.5	32.2
Work Center Supervisor	177	7.2	39.4
Crypto Technician	148	6.0	45.4
Communications Transmitter Technician	113	4.6	50.0
Leading Electronics Technician	100	4.1	54.1
Test Equipment Calibration Technician	96	3.9	58.0
Leading Petty Officer	75	3.0	61.0
NAVAIDS Technician	74	3.0	64.0
Ship's Inertial Navigational System (SINS) Technician	74	3.0	67.0
Leading Chief Petty Officer	56	2.3	69.3
Maintenance Chief/Petty Officer	52	2.1	71.4
Test Equipment Technician	52	2.1	73.5
Division Chief	49	2.0	75.5
Watchstander	48	1.9	77.4
Test Equipment Maintenance Technician	42	1.7	79.1
Supply Petty Officer	41	1.7	80.8
Central Navigation Computer Technician	37	1.5	82.3
Communications Receiver Technician	35	1.4	83.7
Ground Controlled Approach (GCA) Technician	34	1.4	85.1
Identification Friend or Foe (IFF) Technician	33	1.3	86.4
Microwave Technician	30	1.2	87.6
Terminal Equipment Technician	27	1.1	88.7
Administrative Petty Officer	25	1.0	89.7
Automatic Carrier Landing System (ACLS) Technician	24	1.0	90.7
Communications Satellite Technician	24	1.0	91.7
Division Officer	22	.9	92.6

Table B-3 (Continued)

Job Title	No. of ET's Selecting	Percentage of Sample	Cumulative Percentage
Meteorological/Oceanographic Equipment Technician	21	.8	93.4
TACAN Technician	18	.7	94.1
Television Technician	12	.5	94.6
Damage Control Petty Officer (DCPO)	7	.3	94.9
3-M Inspector	6	.2	95.1
Training Petty Officer	6	.2	95.3
Television Studio Technician/Operator	5	.2	95.5
Chief of the Boat	4	.2	95.7
Career Counselor	3	.1	95.8
Instructor (Instructor Billet)	3	.1	95.9
Master-at-Arms (MAA)	3	.1	96.0
Subsystems Technician (Combat Weapons Configuration Ship)	3	.1	96.1
3-M Installation Team Member	2	.1	96.2
Radio Studio Technician/Operator	2	.1	96.3
Systems Technician (Combat Weapons Configuration Ship)	0	.0	96.3
Write-In	82	3.3	99.6
Invalid Response	4	.2	99.8
No Response	4	.2	100.0

Table B-4

Rank Order of Job Titles by Frequency of Selection

for 735 Torpedoman's Mates (TM)

Job Title	No. of TM's Selecting	Percentage of Sample	Cumulative Percentage
Torpedo Technician (Intermediate Level Maintenance)	190	25.8	25.8
Torpedo Operator (Submarine)	94	12.8	38.6
Torpedo Operator (Surface)	58	7.9	46.5
Leading Petty Officer	44	6.0	52.5
Line Supervisor	41	5.6	58.1
Work Center/Shop Supervisor	39	5.3	63.4
ASROC Assemblyman	30	4.1	67.5
Leading Chief Petty Officer	27	3.7	71.2
Quality Assurance (QA) Inspector	19	2.6	73.8
Supply Petty Officer	19	2.6	76.4
Torpedo Test Equipment Technician (Intermediate Level Maintenance)	19	2.6	79.0
Weapons Handling/Transporting Supervisor	19	2.6	81.6
Administrative Petty Officer	18	2.4	84.0
Torpedo Room Supervisor	18	2.4	86.4
Division Chief	17	2.3	88.7
Seaman Gang/Topside Supervisor	16	2.2	90.9
Division Officer	14	1.9	92.8
SUBROC Assemblyman	9	1.2	94.0
Master-at-Arms (MAA)	6	.8	94.8
SUBROC Test Equipment Technician (Intermediate Level Maintenance)	6	.8	95.6
Chief of the Boat	5	.7	96.3
Training Petty Officer	5	.7	97.0
3-M Coordinator (Command)	4	.5	97.5
Diver	2	.3	97.8
Career Counselor	0	.0	97.8
Instructor (Instructor Billet)	0	.0	97.8
Write-In	8	1.1	98.9
Invalid Response	8	1.1	100.0

Table B-5

Rank Order of Job Titles by Frequency of Selection

for 2,774 Yeomen (YN)

Job Title	No. of YN's Selecting	Percentage of Sample	Cumulative Percentage
Administrative Assistant	254	9.2	9.2
Administrative Office Yeoman	252	9.1	18.3
Administrative Office Supervisor	197	7.1	25.4
Officer Records Yeoman	155	5.6	31.0
Operations Yeoman	142	5.1	36.1
Clerk Typist	135	4.9	41.0
Legal Yeoman	135	4.9	45.9
Correspondence/Files Yeoman	119	4.3	50.2
Incoming/Outgoing Mail Yeoman	109	3.9	54.1
Classified Material Control (CMCO) Yeoman	87	3.1	57.2
Captain's Office Yeoman	83	3.0	60.2
Ship's Secretary	74	2.7	62.9
Assistant Administrative Officer	62	2.2	65.1
Special Projects/Programs Yeoman	53	1.9	67.0
Communications Yeoman	52	1.9	68.9
Administrative Secretariat	50	1.8	70.7
Engineering Log Room Yeoman	50	1.8	72.5
Student Control Yeoman	41	1.5	74.0
Training Yeoman	41	1.5	75.5
Administrative Officer	40	1.4	76.9
Enlisted Records Yeoman	40	1.4	78.3
Weapons Yeoman	40	1.4	79.7
Secretary	37	1.3	81.0
Flag/Staff Office Yeoman	33	1.2	82.2
Education and Training Yeoman (including ESO)	28	1.0	83.2
Chaplain's Yeoman	27	1.0	84.2
Flag Writer	25	.9	85.1
TEMADD Yeoman	25	.9	86.0
Transfers/Receipts Yeoman	25	.9	86.9
Legal Office Supervisor	20	.7	87.6
Personnel Office Supervisor	20	.7	88.3
Personnel Officer	19	.7	89.0
Enlisted Detailer	17	.6	89.6
Career Counselor	15	.5	90.1

Table B-5 (Continued)

Job Title	No. of YN's Selecting	Percentage of Sample	Cumulative Percentage
Safety Yeoman	14	.5	90.6
Reports Control Yeoman	13	.4	91.0
Diary Yeoman (Officer/Enlisted)	12	.4	91.4
Public Affairs Office (PAO) Yeoman	12	.4	91.8
Word Processing Center Supervisor	12	.4	92.2
Captain's Writer	11	.4	92.6
Receptionist	11	.4	93.0
Assistant Personnel Officer	10	.4	93.4
FRAMP Yeoman	10	.4	93.8
Postal Yeoman	10	.4	94.2
NATOPS Yeoman	9	.3	94.5
Education and Training Office Supervisor	8	.3	94.8
Assistant Top Secret Control Officer	7	.3	95.1
Enlisted Separations Yeoman	7	.3	95.4
Officer Separations Yeoman	7	.3	95.7
Public Works/Trouble Desk Yeoman	7	.3	96.0
Forms Control Yeoman	6	.2	96.2
Flag Office Supervisor/Manager	5	.2	96.4
Leave Yeoman	5	.2	96.6
Personnel Admin. Assistance Team (PAAT) Yeoman	5	.2	96.8
Staff Writer	4	.1	96.9
Division Officer	3	.1	97.0
Master/Senior/Chief Petty Officer of the Command	3	.1	97.1
Advancement Yeoman	2	.1	97.2
Casualty Assistance Calls Office (CACO) Yeoman	0	.0	97.2
Master Chief of Force	0	.0	97.2
Write-In	39	1.4	98.6
Invalid Response	37	1.3	99.9
No Response	3	.1	100.0

APPENDIX C

EQUIPMENT, TOOLS, AND SUPPLIES USED BY AVIATION BOATSWAIN'S MATE (AB) AVIATION MACHINIST MATE (AD) ELECTRONICS TECHNICIAN (ET) TORPEDOMAN'S MATE (TM) YEOMAN (YN)

Table C-1

Rank Order of 161 Equipment, Tools, and Supplies
That 1,507 Aviation Boatswain's Mates (AB's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AB's Selecting	Percentage of Sample
Common Hand Tools	809	53.7
CO_2 Extinguishers	643	42.7
Sound-Powered Telephones	582	38.6
Hand-Operated Grease Gun	561	37.2
PKP Extinguishers	537	35.6
Chocks	515	34.2
Flight Deck Personal Protective/Safety Equipment	511	33.9
Tie Down Chains	457	30.3
Tow Tractor	455	30.2
Electric Hand Drill	439	29.1
Taxi Wands	439	29.1
Trucks/Pick-Ups	423	28.1
Tow Bars	409	27.1
Electric Deck Sander	371	24.6
Cable Cutter	325	21.6
Torque Wrench	322	21.4
Pneumatic Hammer and Chisel	316	21.0
Pull Hoist (Come-Along)	296	19.6
Twin Agent Unit (TAU) Firefighting Apparatus	294	19.5
Slings (Nylon)	280	18.6
Bench Grinder	277	18.4
Pneumatic Deck Grinder	275	18.2
Self-Contained Breathing Apparatus	266	17.6
Chain Falls	260	17.2
Feeler Gauges	258	17.1
Cable Clamps	248	16.4
Fire Suit (Fireman's Alum. Prox Suit)	240	15.9
Crash Trucks	238	15.8
Aircraft External Power Units	219	14.5
Aircraft Starting Units (Huffer)	219	14.5
PA Systems	218	14.5
Hydraulic Jack	214	14.2
Tubing Cutter	213	14.1

(Continued)

Table C-1(Continued)

Rank Order of 161 Equipment, Tools, and Supplies
That 1,507 Aviation Boatswain's Mates (AB's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AB's Selecting	Percentage of Sample
Block and Tackles	211	14.0
Dynamometer	206	13.7
Porta-Powers	200	13.3
Pressure Fueling Nozzles	200	13.3
Tubing Flaring Kits	196	13.0
Tap/Dyes	193	12.8
Extractor Tool Set (Easy Outs)	192	12.7
Micrometer	187	12.4
Aircraft Crash Cranes	183	12.1
Emergency Entry Tools (Crash and Rescue)	181	12.0
Gravity Fueling Nozzles	176	11.7
High Capacity Foam (HICAP)/Light Water Station	176	11.7
Tennant Grinder	175	11.6
Grid Maps	171	11.3
Drill Press	170	11.3
Electric Saw	166	11.0
Steam Smothering Valve	161	10.7
Crash Dolly	159	10.6
No-Go Gauge	158	10.5
Sounding Tape	152	10.1
Flat Beds	140	9.3
Chain/Rescue Saw (Gasoline)	132	8.8
Air Eductor (Red Devil)	131	8.7
Dye-Penetrate Kit	129	8.6
Flight Deck Aircraft Elevators	129	8.6
E-28 Arresting Gear	124	8.2
Portable Inertness Analyzer (PIA)	124	8.2
Water Pumping Truck	123	8.2
Hand Operator Stripping Pumps	121	8.0
Contaminated Fuel Detector AEL MK3	115	7.6
Nose Tow Launch Hardware	115	7.6
Free Water Detector AEL MK1	114	7.6
SD-1-D Spotting Dolly	114	7.6

(Continued)

Table C-1(Continued)

Rank Order of 161 Equipment, Tools, and Supplies
That 1,507 Aviation Boatswain's Mates (AB's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AB's Selecting	Percentage of Sample
Air Line Hose Mask	110	7.3
Grit Blaster	110	7.3
MRS Tractor	110	7.3
Tank Gauging Equipment	109	7.2
Sprinkler System	104	6.9
Wire Straightners (Brooming Tool)	104	6.9
Aircraft Fueling Trucks	103	6.9
Electric Lighting Generator (Mobile)	103	6.8
Aircraft Passenger Loading Ramp	101	6.7
Arc Welder	100	6.6
Fuel Flow Meter	99	6.6
Runway Foamer Tank Truck	98	6.5
CONFLAG Station	94	6.2
Hangar Bay Fire Doors (Ballistic Doors)	93	6.2
Aircraft Cargo Loading Equipment (K-Loader Hi-Lift, Pallet Dollies, etc.)	91	6.0
C13 Catapult	90	6.0
Mirror Landing System	88	5.8
Mobile Flood Light Set (Electric)	87	5.8
Oxygen/Acetylene Welding Equipment	87	5.8
Aircraft Cargo Pallets	83	5.5
Portable Propane Torch	83	5.5
E-15 Arresting Gear	82	5.4
E-5 Arresting Gear	81	5.4
AV-Lub Truck	79	5.2
Pulley Assembly (Snatch Block)	79	5.2
Bridle Arrestor Slot Cleaner	77	5.1
Hand-Held Flare Gear	77	5.1
Mechanical Jacks (AG)	74	4.9
Aircraft Fueling Skids/Pits	73	4.8
Ladle	73	4.8
Dead Weight Tester	71	4.7
Cable Tension Tester (Tensiometer)	70	4.6
Fresnel Lens System	70	4.6

(Continued)

Table C-1 (Continued)

Rank Order of 161 Equipment, Tools, and Supplies
That 1,507 Aviation Boatswain's Mates (AB's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AB's Selecting	Percentage of Sample
CLA-VAL Fueling Unit	69	4.6
MK-7 Arresting Gear	69	4.6
Runway/Ramp Sweeper	67	4.4
Flash Point Tester	65	4.3
Wire Rope Socket Tester	65	4.3
Flame Safety Lamp	64	4.2
Thief Fuel Sampler	64	4.2
Farm Tractors	62	4.1
Zinc Melting Equipment	61	4.0
CO_2 Truck	60	4.0
Hot Brake Cooling Fans	58	3.8
Tape Reel Stand Assembly	58	3.8
Cylinder Jacking Block Assembly	57	3.8
Seizing Wire Tool	56	3.7
Structural Truck	56	3.7
Fuel Piping Repair Kit	55	3.6
Blackmer Fueling Station	54	3.6
Centrifugal Purifier	54	3.6
Filter Element Test Stand	54	3.6
Temple Sticks	53	3.5
C-7 Catapult	52	3.4
Arresting Gear Engine Ram/Cylinder Support Assembly	51	3.4
Water Washdown System	50	3.3
Base Weldment Press (for Installing Donuts on Arresting Cables)	49	3.2
Oxygen/Nitrogen Cart (Gas)	49	3.2
Liquid Oxygen Cart (LOX)	46	3.0
C-11 Catapult	45	3.0
Combustible Gas Indicator	42	2.8
Barricade Power Package	41	2.7
Flare Dispenser	41	2.7
Portable Pyrometer	41	2.7
Wheels Watch Cart	41	2.7
E-27 Arresting Gear	40	2.6

(Continued)

Table C-1 (Continued)

Rank Order of 161 Equipment, Tools, and Supplies
That 1,507 Aviation Boatswain's Mates (AB's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AB's Selecting	Percentage of Sample
B&A Crane	39	2.6
Rotary Retract Engine	39	2.6
In-flight Refueling Probe Adapter	36	2.4
Fuel Monitor Device	34	2.2
Manually Operated Visual Landing Aid (MOVLAS)	33	2.2
Robb Fitting	30	2.0
Hydraulic Lock Valve Panel	29	1.9
Un-Rep Fuel Probe Adapter	29	1.9
Decelerometer	26	1.7
Magnaflux Unit	25	1.6
Aldis Lamp	24	1.6
Liquidometers	24	1.6
Viscosity Tester	24	1.6
Waste Removal and Servicing Vehicle	22	1.4
Runway Duty Officer Cart (RDO)	21	1.4
MK1 MOD 0 Bridle Arrestor (All American)	19	1.3
Runway Foam Scraper	19	1.3
M-116 All Terrain Vehicle (ATV)	15	1.0
Wayne Fueling Station	13	.9
Wheeler Fueling Station	13	.9
Heli-Arc Welder	12	.8
Amphenol Unit	11	.7
Flight Line Maintenance Master	11	.7
Load Adjuster (Slipstick)	11	.7
Metal Hardness Tester	10	.7
Crash Boat	9	.6
Tactical Fuel Systems (Bladders)	8	.5
Cryogenic Tanks	7	.5
Filter-Generator	7	.5

Table C-2

Rank Order of 228 Equipment, Tools, and Supplies
That 2,568 Aviation Machinist Mates (AD's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AD's Selecting	Percentage of Sample
Flash Light	2,041	79.5
Drip Pans	1,573	61.2
Torque Wrench	1,567	61.0
Safety Wire Pliers	1,535	59.8
Inspection Mirrors	1,477	57.5
Oil Bowsers	1,460	56.8
Tow Tractors	1,402	54.6
Chocks	1,326	51.6
Safety Goggles	1,266	49.3
Tie Downs	1,259	49.0
Vise	1,212	47.2
NC-8	1,199	46.7
Magnets	1,135	44.2
Pick-Up Truck	1,130	44.0
Tow Bars	1,102	42.9
B-4 Stands	1,071	41.7
Metal Files	1,059	41.2
Flat Beds*	1,033	40.2
Jet Engine Special Tools	964	37.5
Pressure Gauges (General Purpose)	955	37.2
Rigging Pins	929	36.2
T-Handles	919	35.8
Go-No-Go Gauge	893	34.8
Quick Engine Change (QEC) Kit	878	34.2
Engine Adapters	874	34.0
Depth Gauge	873	34.0
GTC-85	859	33.4
Micrometer	805	31.3
Intake Screen	792	30.8
Flat Beds*	789	30.7
Equipment Lifting Sling	770	30.0
Grease Gun	765	29.8

(Continued)

* Flat Beds appeared twice in the List of Equipment, Tools, and Supplies.

Table C-2 (Continued)

Rank Order of 228 Equipment, Tools, and Supplies
That 2,568 Aviation Machinist Mates (AD's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AD's Selecting	Percentage of Sample
Grounding Cords	764	29.8
Etching Tool	761	29.6
Pre-Oilers	745	29.0
Dial Indicators	740	28.8
Engine Removal/Installation Adapter	739	28.8
Taxi Wands	721	28.1
Whistles	718	28.0
Dye Penetrant Test Kit	717	27.9
Forklifts	715	27.8
Pneumatic Hand Drill	712	27.7
Face Shields	692	26.9
3000A Stands	679	26.4
4000A Stands	657	25.6
Engine Accessory Special Tools	653	25.4
Rigging Tools	646	25.2
Sweeny Wrenches	636	24.8
Electric Hoist (Bridge Crane)	609	23.7
Jet-Cal Analyzer	567	22.1
Thermocouple Tester	561	21.8
Propeller Special Tools	558	21.7
Magnifying Glass	544	21.2
Electric Hand Drill	540	21.0
Bench Grinder	528	20.6
Tachometer	527	20.5
Propeller Dollies	523	20.4
Spray Gun	512	19.9
Chain Fall	495	19.3
Pressure Regulators	489	19.0
Vacuum Cleaner	481	18.7
Impact Wrench	464	18.1
Fuel Cell Removal Tools	460	17.9
Boarding Ladders	458	17.8
NC-5	457	17.8
B-5 Stands	451	17.6
Hand Pump Fire Extinguisher	448	17.4

(Continued)

Table C-2 (Continued)

Rank Order of 228 Equipment, Tools, and Supplies
That 2,568 Aviation Machinist Mates (AD's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AD's Selecting	Percentage of Sample
Hydraulic Jacks	433	16.9
Propeller Stands	432	16.8
Stand-Off Gauges	429	16.7
Constant Speed Drive (CSD) Service Unit	415	16.2
Bearing Puller	414	16.1
Drill Press	407	15.8
Rubber Gloves	406	15.8
Nitrogen Cart	395	15.4
Flow Meters	394	15.3
Air Compressors	382	14.9
Personal Survival Equipment	374	14.6
Aircraft/Equipment Lifting Cranes	368	14.3
L-Stand	366	14.2
Radio Transmitter/Receivers	360	14.0
Multimeter	351	13.7
Timing Light (PPI)	348	13.6
Cylinder Compression Tester	346	13.5
Turbine Stands	346	13.5
Thermometers	337	13.1
Well-Start Units	333	13.0
NC-10	330	12.8
Reciprocating Engine Special Tools	330	12.8
Ultrasonic Cleaner	326	12.7
Vanco Light	317	12.3
Gear Puller	316	12.3
Ring Compressor	302	11.8
Cold Cylinder Indicator	295	11.5
Hydraulic Jennies	273	10.6
Soldering Iron	268	10.4
Wheel Pullers	263	10.2
Bell-Mouth	252	9.8
Piston Pin Puller	251	9.8
Pneumatic Caulking Gun	243	9.5
Pneumatic Ratchets	241	9.4
Vibration Tester	236	9.2

(Continued)

Table C-2 (Continued)

Rank Order of 228 Equipment, Tools, and Supplies
That 2,568 Aviation Machinist Mates (AD's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AD's Selecting	Percentage of Sample
Microfilm Reader/Reproducer	230	9.0
MD-3 Tow Tractor/Starting Unit	225	8.8
16mm Projector	223	8.7
Blade Protractor	223	8.7
High Voltage Tester	222	8.6
Pneumatic Hand Grinder	222	8.6
Temperature Datum Tester (TD)	208	8.1
Runout Gauge	202	7.9
Inlet Guide Vane (IGV) Tester	198	7.7
3110 Stand	197	7.7
A-Stand	197	7.7
Pneumatic Aircraft Washing Machine	197	7.7
NCPP-105	196	7.6
MMG-2 Power Unit	192	7.5
Weight/Balance Calculator	191	7.4
Buddy Stores Racks	188	7.3
Ignition Analyzer	185	7.2
Flare Guns	183	7.1
RCPP-105	183	7.1
CSD Cocking Tools	176	6.8
Electric Hand Grinder	175	6.8
High Voltage Ignition Test Unit	175	6.8
Paper Filter Respirator	175	6.8
Propeller Alignment Tools	175	6.8
NC-7	169	6.6
Templates	168	6.5
Engine Electronic Component Tester	159	6.2
Mobile Flood-Light Units	158	6.2
Manometer	150	5.8
B-1 Stand	149	5.8
Slide Projector	149	5.8
NB-2 Power Unit	139	5.4
Hot Oil Bath	135	5.2
Microfiche Viewer	135	5.2
Afterburner Stands	134	5.2

(Continued)

Table C-2 (Continued)

Rank Order of 228 Equipment, Tools, and Supplies
That 2,568 Aviation Machinist Mates (AD's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AD's Selecting	Percentage of Sample
Silent Hoist	129	5.0
Stress Gauges	129	5.0
Blade Tape	122	4.8
NB-3 Power Unit	119	4.6
NC-2 Power Unit	118	4.6
Gaseous Oxygen Cart	115	4.5
Mobile Jet Engine Test Stand	115	4.5
Fuel Manifold Tester	114	4.4
Nozzle Actuator Tester	114	4.4
NR-8 Air Conditioning Unit	113	4.4
Smoke Lights	110	4.3
MD-9 Computer	106	4.1
Delta-P Tester (Differential Pressure)	105	4.1
Arbor Press	101	3.9
Frequency Meters	97	3.8
Exhaust Nozzle Control (ENC) Tester	94	3.7
ADI Cart	92	3.6
Butane Torch	91	3.5
Stretch Gauge	91	3.5
LOX Cart	90	3.5
Rivet Anvil	89	3.5
MK-7 Bomb Cart	88	3.4
RO-14C Bomb Hoist	80	3.1
Flow Bench	79	3.1
NC-12	79	3.1
Sight Glass Removal Tool	79	3.1
Synchro-Phaser Tester	79	3.1
In-flight Refueling (IFR) Control Box Tester (K Tester)	78	3.0
B-2 Stands	77	3.0
Alignment Jigs	76	3.0
GTC-100 Air Start Unit	76	3.0
Carbon Seal Tester	75	2.9
Electronic Calculation	74	2.9
Spray Bar Tester	74	2.9

(Continued)

Table C-2 (Continued)

Rank Order of 228 Equipment, Tools, and Supplies
That 2,568 Aviation Machinist Mates (AD's) Operate, Use, and Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AD's Selecting	Percentage of Sample
Bearing Gauge	73	2.8
Heat Treating Ovens	72	2.8
Tachometer Testers	70	2.7
NR-10 Air Conditioning Unit	69	2.7
Steam Jenny	69	2.7
Electronic Blade Tracker	67	2.6
Fuel Manifold Supports	67	2.6
Stator Position Indicator	67	2.6
Vac-U-Blast	67	2.6
Ramp Master	66	2.6
Rivet Press	64	2.5
Propeller Analyzer	62	2.4
Stripping Tank	60	2.3
Nose Weights	57	2.2
RY-400 Power Unit	57	2.2
MMG-1 Power Unit	55	2.1
Propeller Vibration Analyzer (PVA)	55	2.1
Class "C" Test Cell	54	2.1
Hook Gauges	53	2.1
Tail Rotor Balancing Unit	53	2.1
Floor Sweepers (Tractor Type)	52	2.0
Stack Temperature Indicator	50	1.9
Valve Housing Test Stand (Hamilton Std)	50	1.9
Class "A" Test Cell	49	1.9
Vane Actuator (Pitch Tester)	49	1.9
Telescope Stand (Transit)	47	1.8
NR-5 Air Conditioning Unit	46	1.8
Distributor and Magneto Test Stand	45	1.8
Oxy-Acetylene Torch	44	1.7
GP8-2 Propeller Governor Test Stand (Greer Governmatic)	41	1.6
Power Converters	40	1.6
Boarding Ladder Truck	38	1.5
HSP1773 Hydraulic Propeller Tester	27	1.0
Electric Arc Welder	26	1.0

(Continued)

Table C-2 (Continued)

Rank Order of 228 Equipment, Tools, and Supplies
That 2,568 Aviation Machinist Mates (AD's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment, Tools, and Supplies	No. of AD's Selecting	Percentage of Sample
"Fairchild" Cartridge Film Projector	23	.9
Oil Cooler Test Stand (4-Stage Cleaner)	22	.8
EB-16 Flushing Cart	20	.8
Scale Shadowgraph	17	.7
Paper Shredder	15	.6
NR-2 Air Conditioning Unit	14	.5
Snow Plow	14	.5
Airborne Mine Sweep Gear	13	.5
Pulse Ratio Gauge	13	.5
Pendulum Type Balancer (Hydraulic)	12	.5
Ultrasonic Blade Tester	12	.5
VPT-10 Tester	12	.5
NA-5 Power Unit	11	.4
NR-1 Air Conditioning Unit	11	.4
Control Surface Checker (Throw Board)	9	.4
Gasoline Powered Cooling Fan	9	.4
NR-3 Air Conditioning Unit	9	.4
Computer Terminals	8	.3
ATE-20 Power Unit	6	.2
GPD-5 Power Unit	6	.2
Airborne Sonar	5	.2
CDM-5 Power Unit	5	.2
CDM-15 Power Unit	5	.2

Table C-3

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
Screwdrivers (such as Jewelers, Phillips, Flat)	2,225	90.2
Soldering Iron/Gun	2,196	89.0
Long Nosed Pliers	2,168	87.9
Solder (Rosin Core)	2,140	86.7
Allen Wrenches	2,116	85.8
Volt-Ohm-Milliammeter (VOM)	2,072	84.0
Dual Trace Oscilloscopes (AN/USM-105, 140, 281, etc.)	2,000	81.1
Wire Stripping Tools	1,973	80.0
Wrenches (such as Adjustable, Pipe, Open End)	1,940	78.6
Frequency Counters	1,908	77.3
Soldering Aid Tools	1,829	74.1
Diagonal Side Cutters	1,808	73.3
Electronic Equipment Alignment Tools/Tool Kits	1,717	69.6
Abrasives (such as Files, Emery Cloth, Sand Paper)	1,701	69.0
Cleaning Solvents	1,627	66.0
Nut Drivers/Spin Tites	1,593	64.6
Audio Frequency Signal Generator	1,557	63.1
Crimping Tools	1,541	62.5
Tube Testers	1,528	61.9
Multi-Function Vacuum Tube Volt Meter (VTVM)	1,470	59.6
Hammers/Mallets	1,453	58.9
Dummy Loads	1,450	58.8
Vacuum Cleaner	1,448	58.7
Fuse Pullers	1,438	58.3
Tube Pullers	1,428	57.9
AC Vacuum Tube Volt Meter (AC VTVM)	1,410	57.2
VHF/UHF Signal Generator	1,348	54.6
Megohmmeter (Megger)	1,310	53.1
Power Meters (such as Wattmeters, Bolometers)	1,293	52.4

(Continued)

Table C-3 (Continued)

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
VLF/LF/HF Signal Generator	1,182	47.9
Bristo Wrenches	1,159	47.0
DC Vacuum Tube Volt Meter (DC VTVM)	1,084	43.9
Single Trace Oscilloscopes (OS-8, AN/USM-34, etc.)	1,025	41.5
Digital Volt-Ohm-Meter	955	38.7
Frequency Standards	924	37.4
Voltage Standing Wave Ratio (VSWR) Meter	919	37.2
Differential Volt Meter (Fluke Meter)	903	36.6
High Voltage Probe	851	34.5
Safety Gloves (such as Rubber, Leather Palm)	843	34.2
Octopus	821	33.3
Audio Amplifiers (AM-215, AM-3729, etc.)	805	32.6
Mirrors	804	32.6
R-1051 Series	748	30.3
Sweep Signal Generator	738	29.9
Screw Extractors (Easy Outs)	736	29.8
Variable DC Power Supplies	723	29.3
Speakers (Radio Remotes, Entertainment, etc.)	711	28.8
Spectrum Analyzer	703	28.5
Transistor Tester	668	27.1
Trigger Pulse Generators	631	25.6
Step Attenuators	630	25.5
Magnifying Glass	613	24.8
Tap and Die Sets	613	24.8
DC Patch Boards	605	24.5
R-390 Series	601	24.4
Special Purpose Oscilloscopes (such as Multi-Trace, TDR, Storage)	598	24.2
Audio Level Meters	596	24.2
SHF and Above Signal Generator	584	23.7
Capacitance Tester (R-C-L Bridge, ZM-11, etc.)	583	23.6
Receiver Transfer Panels	556	22.5

(Continued)

Table C-3 (Continued)

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
Transmitter Transfer Panels	543	22.0
Variable Attenuators	539	21.8
Receiver Antenna Distribution Systems	537	21.8
Radar Range Calibrator	536	21.7
RF Millivoltmeter	532	21.6
IFF Test Sets (AN/UPM-70/98/99/137, etc.)	526	21.3
Distortion Analyzers	511	20.7
Square Wave Generators	500	20.3
Pin Extraction Tools	488	19.8
Synchro/Servo Amplifiers	484	19.6
Banding Tools	483	19.6
Strobotacs	478	19.4
UHF Communications Antennas	477	19.3
HF/UHF Multicouplers	473	19.2
HF Communications Antennas	458	18.6
External Echo Box	456	18.5
Transmitter Antenna Patching Facility	442	17.9
AN/URC-9 Series	436	17.7
Relay Test Sets	436	17.7
Multi-Channel Tape Recorders	434	17.6
Radar Video Amplifiers	432	17.5
Solder (Acid Core)	432	17.5
AN/URA-17 Series	425	17.2
Battery Chargers	425	17.2
AN/SRC-20 Series	423	17.1
Pin Insertion Tools	423	17.1
Radar Trigger Amplifiers	418	16.9
AN/SPS-10 Series	399	16.2
Radio Remotes (C-1138, C-1204, etc.)	394	16.0
Silver Solder	394	16.0
Frequency Standards Distribution System	393	15.9
Sonic Cleaner	370	15.0
Frequency Meters (Absorption Type)	360	14.6
AN/SRC-21 Series	350	14.2
Isolation Transformer	350	14.2

(Continued)

Table C-3 (Continued)

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
Variable Transformer	343	13.9
AN/WRC-1 Series	342	13.9
Trasmitter Tuners	342	13.9
Synchro/Servo Test Set	341	13.8
Time Marker Signal Generators	341	13.8
Decade Resistors	337	13.7
Phase Sensitive Volt Meter	332	13.4
AN/SPA-25 Series	328	13.3
KW-7	324	13.1
AN/SPA-4 Series	306	12.4
AN/URT-23	291	11.8
Miniature/Microelectronics Repair Kit	287	11.6
Radar Switchboards	287	11.6
AN/URT-7 Series	283	11.5
Secure Voice Remotes	272	11.0
System to Subsystem Analog-Digital/ Digital-Analog Converters	267	10.8
AN/SRR-19 Series	263	10.7
AN/UPN-12 Series	261	10.6
Remote Channel Select Units (C-3868, etc.)	256	10.4
Paper Tape Reader	255	10.3
AN/UCC-1 Series	254	10.3
AN/VRC-46	251	10.2
Ship's Entertainment Distribution System (Audio)	248	10.0
Movie Projectors	246	10.0
AN/WRR-3 Series	245	9.9
Commercial Portable Transceivers	242	9.8
Crystal Rectifier Test Set	241	9.8
Decade Capacitors	240	9.7
AN/URC-32 Series	238	9.6
AN/URR-27 Series	237	9.6
Tape Demagnetizer	236	9.6
KW-37	234	9.5
Tape Recorder Head Demagnetizer	234	9.5

(Continued)

Table C-3 (Continued)

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
X-Y Recorder	231	9.4
Commercial Mobile Transceivers	229	9.3
AN/SGC-1 Series	221	9.0
MK-10 IFF System	221	9.0
AN/WRT-2 Series	216	8.8
Hand Voltage Tester	213	8.6
Paper Tape Puncher	205	8.3
Ship's Inertial Navigational System (SINS)	205	8.3
AN/URR-35 Series	203	8.2
TED Series	198	8.0
Secure Voice Matrix	197	8.0
AN/URT-24	183	7.4
AN/SRN-12	182	7.4
AN/BPS Series	177	7.2
AN/PRC-77	174	7.0
Field Strength Meter	174	7.0
KY-8	174	7.0
Single Channel Tape Recorders	168	6.8
AN/URC-35 Series	165	6.7
AN/WRT-1 Series	165	6.7
System to Subsystem Buffers	159	6.4
Decade Inductors	155	6.3
Pathfinder Series Radar	154	6.2
AN/FRT-39 Series	148	6.0
KG-14	148	6.0
Pipe Cutting Tools	136	5.5
AN/PRC-25	131	5.3
Duck Seal	131	5.3
AN/SPA-8 Series	128	5.2
AN/SPS-40 Series	126	5.1
Beacon Keyer Units (LF, HF, UHF, etc.)	126	5.1
Page Printer	125	5.1
CCTV Distribution System	123	5.0
Color Bar Generator	122	4.9

(Continued)

Table C-3 (Continued)

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
Universal Keyboards	119	4.8
AN/BQN-3 Series	117	4.7
AN/BRN-3 Series	117	4.7
AN/SPA-66 Series	117	4.7
Flaring Tools (Tubing)	117	4.7
AN/URD-4 Series	110	4.4
Central Navigation Computer	110	4.4
Telephone Patch Panels	109	4.4
KG-13	104	4.2
AN/FRT-40 Series	103	4.2
AN/UQN-1 Series	103	4.2
Mobile Gas/Diesel Powered Generators (such as PU-390/G-60KW)	101	4.1
Card Reader	97	3.9
MK-12 AIMS IFF System	97	3.9
TV Analyst	94	3.8
AN/ARC-27 Series	93	3.8
AN/BRR-3 Series	91	3.7
AN/VRC-80	87	3.5
FM-10	85	3.4
LN-66	82	3.3
TV Studio Equipment	81	3.3
AN/BRN-5	80	3.2
AN/SPA-50 Series	77	3.1
Portable Gas/Diesel Powered Generators	77	3.1
AN/SPA-74	76	3.1
AN/SRN-9 Series	75	3.0
MK-12 IFF System	73	3.0
KW-26	67	2.7
AN/GRC-27 Series	63	2.6
AN/GRT-21	62	2.5
Bendix Series Radar	62	2.5
TH-39/UGT Series	61	2.5
Video Mapping Equipment (such as AN/GPA-91)	58	2.4

(Continued)

Table C-3 (Continued)

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
Alden Recorders	57	2.3
AN/UXH-2 Series	57	2.3
Vibration Analyzers	57	2.3
AN/URA-8 Series	52	2.1
AN/ARC-51 Series	51	2.1
AN/SPN-40	51	2.1
AN/SPS-53 Series	49	2.0
CATV Distribution System	49	2.0
KY-3	49	2.0
AN/CPN-4 Series	48	1.9
AN/SPA-33 Series	48	1.9
AN/URN-3 Series	48	1.9
AN/SRN-6 Series	47	1.9
AN/SPA-34 Series	46	1.9
AN/SPS-29 Series	45	1.8
PPS-200C Welding/Soldering Tool	45	1.8
AN/GMQ-13 Series	44	1.8
AN/URN-20 Series	44	1.8
Card Punch	44	1.8
Radio Studio Equipment/Distribution System	44	1.8
AN/SRC-22(V)	43	1.7
Stethoscope	42	1.7
AN/FRT-84(V)	41	1.7
AN/SPS-37	40	1.6
AN/GRT-20	39	1.6
AN/FPN-36	37	1.5
DECCA Series Radar	37	1.5
AN/SPN-42	36	1.4
AN/FPN-52	35	1.4
AN/FRC-70	35	1.4
AN/SPN-43 Series	35	1.4
AIMS/DAIR IFF System	34	1.4
AN/GMQ-10 Series	34	1.4
AN/UPN-15 Series	34	1.4

(Continued)

Table C-3 (Continued)

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
AN/FRR-60 Series	33	1.3
Steamvalve System	33	1.3
CV-1066/UX Series	31	1.2
AN/SPN-44	30	1.2
AN/UMQ-5 Series	30	1.2
AN/FRT-72 Series	29	1.2
AN/SPS-30 Series	29	1.2
AN/WRR-2 Series	29	1.2
AN/FPN-47	28	1.1
AN/SPS-43	28	1.1
AN/GMQ-14 Series	27	1.1
AN/WRR-1	27	1.1
AN/FRT-83(V)	26	1.0
AN/SMQ-6	26	1.0
AN/WSC-5(V)	26	1.0
AN/SPA-63	24	1.0
AN/SPS-5 Series	24	1.0
AN/SRN-15	24	1.0
AN/UQN-4	24	1.0
OD-58/T	24	1.0
AN/FRT-85(V)	23	.9
AN/SPA-59 Series	23	.9
AN/GRT-3 Series	22	.9
AN/SMQ-1 Series	21	.8
AN/FRT-19	20	.8
CV-591 Series	20	.8
AN/FRR-73	19	.8
AN/SPA-62	19	.8
AN/WSA-1 Series	18	.7
AN/FRT-17 Series	17	.7
AN/SPN-12	17	.7
AN/GRN-9 Series	16	.6
AN/URT-19(V)	16	.6
AN/SPS-6 Series	15	.6
KY-28	15	.6
TT-321/UX Series	15	.6

(Continued)

Table C-3 (Continued)

Rank Order of 300 Equipment/Tools/Systems
That 2,467 Electronics Technicians (ET's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of ET's Selecting	Percentage of Sample
AN/GMQ-27	14	.6
AN/SPA-40	14	.6
AN/SPN-10	14	.6
AN/SPN-35 Series	14	.6
AN/UPA-43	14	.6
AN/WRC-1(V)	14	.6
AN/FRR-21	13	.5
AN/SPS-4	13	.5
MD-168/UX Series	13	.5
AN/SPN-6	11	.4
AN/UYK-20	11	.4
AN/FRC-16	10	.4
AN/GMQ-19 Series	10	.4
AN/UPA-57	10	.4
KG-30	10	.4
AN/URN-5	9	.4
KY-38	9	.4
AN/FRT-86(V)	8	.3
AN/GRC-169 Series	7	.3
AN/SPS-21 Series	6	.2
AN/SPS-48 Series	6	.2
AN/UXH-39	5	.2
AN/FRT-18 Series	4	.2
AN/SPS-8 Series	4	.2
AN/URD-2 Series	4	.2
KY-65	4	.2
AN/SPS-39 Series	3	.1
AN/FPS-81 Series	2	.1
AN/SPS-42	2	.1
AN/SPS-17 Series	1	.0
AN/SPS-55	1	.0
AN/FPN-16 Series	0	.0
AN/MPN-5 Series	0	.0
AN/SGA-3 Series	0	.0
AN/TPN-28	0	.0

Table C-4

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
Common Hand Tools	615	83.7
Hoisting Straps/Slings	602	81.9
Personnel Safety Clothing (Hard Hats, Steel Toe Safety Shoes, etc.)	568	77.3
Low Pressure Air System	561	76.3
Chain Falls (Manual)	519	70.6
Torque Wrenches	516	70.2
High Pressure Air System	505	68.7
Torpedo Stowage Rack	498	67.8
Electric Power Tools (Drills, Impact Wrenches, etc.)	488	66.4
Pressure/Vacuum Gages	473	64.4
Handling Lines (Tail, Snubbing, etc.)	467	63.5
Small Arms	459	62.4
Volt-Ohm-Milliamp Meter (VOM)	456	62.0
Safety Straps	455	61.9
Manual Grease Gun	406	55.2
Pressure Hose	397	54.0
Solder Irons/Guns	381	51.8
Universal Handling Dolly	375	51.0
Copying Machines (Xerox, IBM, Thermofax, etc.)	351	47.8
Vacuum-Air-Nitrogen Distribution System (VAND)	348	47.3
Spanner Wrench	343	46.7
Air Hoist	337	45.8
Typewriter (Electric/Manual)	337	45.8
Intercommunications Systems	336	45.7
Safe	314	42.7
Protective Clothing (Agetine, Otto Fuel, Navol, etc.)	301	41.0
Inspection Mirrors	289	39.3
Pneumatic Systems	289	39.3
Electric Hoist	283	38.5
Megohmmeter (Megger)	282	38.4

(Continued)

Table C-4 (Continued)

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
Tap and Die Set	273	37.1
Electrically Propelled Torpedo Special Tools	261	35.5
Hydraulic Systems	253	34.4
Feeler Gage	250	34.0
Pneumatic Power Tools (Drills, Impact Wrenches, etc.)	248	33.7
Sprinkler System (Magazine, Shop, etc.)	247	33.6
Propeller Wrench	244	33.2
Nuclear Weapons Special Tools	226	30.7
Loading Skids	221	30.1
Stop Watches	217	29.5
Steam/Mechanical Torpedo Special Tools	212	28.8
Hydraulic Hoist	208	28.3
Heat Gun	201	27.3
Loading Trays	201	27.3
Block and Tackle	200	27.2
Nose Cage	197	26.8
Warhead Protective Ring	187	25.4
AC Vacuum Tube Voltmeter (VTVM)	186	25.3
Payout Wire Splicing Equipment	177	24.1
Submerged Torpedo Tubes	174	23.7
Sluing Tool	173	23.5
Film Viewer	172	23.4
Bench Grinder	170	23.1
Depth Gages	170	23.1
DC Vacuum Tube Voltmeter (VTVM)	168	22.8
Thread Protectors	168	22.8
Tilt Stand	168	22.8
Banding Machine	166	22.6
Basier Type 4 Power Supply	166	22.6
Forklift	165	22.4
Micrometer	165	22.4
400 Cycle Generator	164	22.3
Special Flashlights	157	21.4

(Continued)

Table C-4 (Continued)

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
Non-Ferrous Tools	156	21.2
Signal Ejector	155	21.1
Loading Ram (Hydraulic)	153	20.8
MK-48 System: MK-15 MOD-0 Otto Fuel Detector	153	20.8
Drip Pan	151	20.5
Oscilloscope	149	20.3
Hypodermic Needle	148	20.1
Solvent Tank	148	20.1
Capstan/Windlass	147	20.0
Paper Shredder	138	18.8
MK-14 System: Leak Meter (WA 4566)	137	18.6
Component Trays	136	18.5
Air Compressor (HP, LP, etc.)	132	18.0
Microfilm Reader/Printer	132	18.0
Electronic Counter	130	17.7
Battery Charger	129	17.6
MK-14 System: Control Valve Test Panel (WA 2390)	129	17.6
Dead Weight Tester	128	17.4
Explosives Transport Vehicles (Trucks, Trailers, etc.)	127	17.3
Radiac Equipment	127	17.3
Drill Press	123	16.7
MK-45 System: T337A	122	16.6
MK-16 System: Indicator Panel (MK-25, MOD 2, 3, or 4)	115	15.6
MK-21 Indicator Panel	113	15.4
Submarine Rocket System (SUBROC): T3154	113	15.4
Dip Tank	109	14.8
Submarine Rocket System (SUBROC): T3055	109	14.8
Bearing Pullers	108	14.7
Multigas Detector	108	14.7
Deluge Shower and Eye Bath	107	14.6
Paint Sprayer	99	13.5
Vernier Scale	99	13.5

(Continued)

Table C-4 (Continued)

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
MK-437 MOD-0 Presetter	98	13.3
Lapping and Polishing Equipment	94	12.8
Above Water Torpedo Tubes	93	12.6
Boom Crane	91	12.4
MK-44/46 Systems: MK-432 Test Set	91	12.4
MK-44/46 Systems: Presetter (DD 294540)	90	12.2
MK-14 System: General Use Test Panel (WA 16032)	88	12.0
MK-14 System: Charging Valve Test Set (LD 287213)	87	11.8
Arbor Press	85	11.6
MK-432 Test Set	85	11.6
Scott Air Pac	85	11.6
Adding Machines/Calculators	82	11.2
Loading Ram (Manual)	80	10.9
Hydraulic Jack (Porta-Power)	77	10.5
MK-46 System: Presetter (LD 294540)	77	10.5
Oxygen/Acetylene Torch	77	10.5
MK-14 System: Leakage Test Set (LD 475511)	76	10.3
Magnifying Glass	75	10.2
MK-14 System: Control Valve Test Panel (LD 160440)	75	10.2
Resistor Decades	75	10.2
Transistorized Volt-Ohmmeter (TVOM)	75	10.2
De-Fueling Nozzle	73	9.9
MK-37 System: Dead Weight Tester (DWG 877583)	73	9.9
MK-37 System: Finswitch-Enabler Simulator (LD 273480)	72	9.8
Torpedo Retrieving Boom	72	9.8
MK-37 System: Battery Simulator (LD 477447)	71	9.6
MK-37 System: Depth Simulator (LD 273481)	71	9.6
MK-37 System: Rate Gyro Table (LD 485413)	71	9.6
MK-46 System: MK 440 MOD 0 Test Set	71	9.6
MK-37 System: Pitch Search Simulator (LD 613322)	70	9.5
MK-46 System: MK 444 MOD 0 Test Set	70	9.5
MK-46 System: MK 485 MOD 0 Test Set	70	9.5

(Continued)

Table C-4 (Continued)

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
MK-37 System: MK 281 MOD 0 Test Set	69	9.4
MK-37 System: Panel Simulator (LD 273480)	69	9.4
MK-46 System: MK 445 MOD 0 Test Set	69	9.4
MK-46 System: MK 484 MOD 0 Test Set	68	9.2
Retrieving Nose Cage	68	9.2
MK-37 System: MK 312 MOD 0 Test Set	67	9.1
MK-37 System: MK 349 MOD 1 Test Set	66	9.0
MK-37 System: MK 393 MOD 0 Test Set	66	9.0
MK-46 System: MK 486 MOD 0 Test Set	66	9.0
Pneumatic Grease Gun	65	8.8
Signal Generator	64	8.7
Calipers	63	8.6
MK-44 System: Presetter (LD 294540)	63	8.6
MK-14 System: Impeller Test Tool (LD 161238)	62	8.4
MK-16 System: Leakage Pressure Test Set (WA 2857)	61	8.3
MK-14 System: Leakage Test Set (LD 160351)	60	8.2
MK-14 System: General Use Test Panel (LD 160423)	58	7.9
Ultrasonic Cleaner	58	7.9
Missile Crane/Boom	57	7.8
MK-46 System: MK 475 MOD 0 Test Set	57	7.8
MK-37 System: Actuator, Current Measuring Device (LD 273482)	56	7.6
MK-46 System: MK-46 Maintenance Aids	56	7.6
MK-46 System: MK 439 MOD 0 Test Set	56	7.6
MK-46 System: MK 443 MOD 1 Test Set	55	7.5
MK-14 System: WA 2857 Test Set	53	7.2
MK-16 System: Leakage Test Set (1390426)	52	7.1
MK-37 System: MK 292 MOD 1 Test Set	52	7.1
MK-46 System: MK 442 MOD 0 Test Set	52	7.1
MK-44 System: MK 292 MOD 1 Test Set	50	6.8
MK-14 System: Air Chamber Test Set (LD 160801)	49	6.7
MK-16 System: Indicator Panel MK-25 MOD 2, 3, 4, or 5	49	6.7
MK-44 System: Afterbody Tester (LD 298618)	49	6.7

(Continued)

Table C-4 (Continued)

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
MK-44 System: MK 315 MOD 2 Test Set	49	6.7
MK-44 System: Panels Tester (LD 294543)	49	6.7
MK-46 System: MK 487 MOD 0 Test Set	49	6.7
MK-44 System: Power Control Unit (LD 294549)	48	6.5
MK-14 System: MK-281 MOD-0 Test Set	47	6.4
MK-44 System: Calibration Box (LD 620055)	46	6.2
SUBROC System: T-3055 Test Set	46	6.2
MK-14 System: Charging Valve Type Test Set (LD 287213)	45	6.1
MK-16 System: WA 5033 Test Set	44	6.0
Isolation Transformer	43	5.8
Alignment Jigs	42	5.7
MK-14 System: General Use Test Panel (LD 495804)	42	5.7
MK-14 System: Reducing Valve Test Outfit (LD 274773)	42	5.7
Phase Meter	42	5.7
SUBROC System: IC/T2 Series Test Sets	42	5.7
SUBROC System: T-3154 Test Set	42	5.7
ASROC System: ISA Safety Chamber (LD 497717)	41	5.6
MK-44 System: Gyro Test Stand (LD 485413)	40	5.4
S BROC System: T-3054 Test Set	40	5.4
ASROC System: MK 361 Test Set	39	5.3
MK-37 System: MK 349 MOD 0 Test Set	39	5.3
Variac Resistor	39	5.3
Single Phase 60 Cycle Generator	38	5.2
Thermo-Couple Volt-Ohmmeter	38	5.2
Thermo-Humidigraph	37	5.0
ASROC System: T-3076A Test Set	36	4.9
MK-14 System: Spray and Check Valve Test Outfit (WA 2651)	36	4.9
ASROC System: MK 484 Test Set	35	4.8
MK-14 System: Reducing Valve Test Outfit (LD 274774)	35	4.8
MK-37 System: MK 281 MOD 1 Test Set	35	4.8
Precision Volt-Ohmmeter (Fluke Meter)	34	4.6
Wheatstone Bridge	34	4.6

(Continued)

Table C-4 (Continued)

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
MK-14 System: Leakage Test Set (LD 475511)	33	4.5
MK-48 System: MK 15 Test Set	32	4.4
Teletype Equipment	32	4.4
MK-45 System: MK 364 MOD 1 Test Set	31	4.2
MK-45 System: MK 365 MOD 1 Test Set	31	4.2
MK-45 System: MK 366 MOD 1 Test Set	31	4.2
MK-48 System: Igniter Test Set (Alinco 1015BF5)	31	4.2
Barometer	30	4.1
MK-45 System: MK 385 MOD 1 Test Set	30	4.1
MK-48 System: Velocity Sensor Switch Assembly Test Actuator	29	3.9
SUBROC System: T-3052 Test Set	29	3.9
SUBROC System: T-3053 Test Set	29	3.9
SUBROC System: T-3102 Test Set	29	3.9
SUBROC System: T-3103 Test Set	29	3.9
SUBROC System: MK 438 MOD 0 Test Set	28	3.8
SUBROC System: T-3104 Test Set	28	3.8
Butane Torch	27	3.7
Emergency Generator (No-Break System)	27	3.7
MJ-2 Boom Truck	27	3.7
MK-45 System: Calibration Unit (LD 587580)	27	3.7
Vacuum Tube Tester	27	3.7
Step Attenuator	26	3.5
SUBROC System: MK 455 Test Set	26	3.5
Type 721 Power Supplies	26	3.5
MK-45 System: MK 285 MOD 0 Test Set	25	3.4
MK-48 System: MK 5 MOD 0 Test Set	25	3.4
Mule	25	3.4
SUBROC System: MK 434 MOD 0 Test Set	25	3.4
SUBROC System: Calibration Standard Pressure Gages	24	3.3
Diving Gear (SCUBA Suit, Tanks, John Brown Suit, etc.)	23	3.1
MK-16 System: Afterbody Adjusting and Test Stand (DWG 694575)	23	3.1

(Continued)

Table C-4 (Continued)

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
MK-16 System: Air Chamber Test Set (LD 160801)	23	3.1
Transistor Curve Tracer (Oscilloscope Plug-In)	23	3.1
Torpedo Retrieving Assembly (Retriever)	22	3.0
MK-48 System: MK 6 MOD 0 Test Set	21	2.8
MK-48 System: MK 525 Test Set	21	2.8
MK-48 System: MK 541 Test Set	20	2.7
MK-48 System: MK 562 Test Set	20	2.7
SUBROC System: T-3054A Test Set	20	2.7
Type 2 Power Supply	20	2.7
MK-48 System: MK 519 Test Set	19	2.6
MK-48 System: MK 542 Test Set	19	2.6
MK-48 System: MK 556 Test Set	19	2.6
SUBROC System: Calibration Standard Cells	19	2.6
SUBROC System: Sanborn Recorder	19	2.6
Variable Phase Generator	19	2.6
MK-16 System: Air Flask Test Fixture (LD 620218)	18	2.4
MK-16 System: Governor Test Stand (694567)	18	2.4
MK-16 System: Afterbody and Exercise Head Leak Test Set (LD 160351)	17	2.3
MK-16 System: Leakage Test Set (LD 475511)	17	2.3
MK-48 System: MK 558 Test Set	16	2.2
MK-48 System: MK 559 Test Set	15	2.0
MK-16 System: Weight, Test Assembly, Depth Mechanism (LD 160826)	14	1.9
ASROC System: MK 440 MOD 0 Test Set	13	1.8
Autotransformer	13	1.8
MK-16 System: Afterbody and Exercise Head Leak Test Set MK 281 MOD 1	13	1.8
MK-16 System: Depth Mechanism Test Stand (LD 274770)	12	1.6
MK-16 System: Gyro Adjusting Stand (LD 41301)	12	1.6
MK-16 System: Gyro Bearing Tester (LD 160825)	12	1.6
MK-16 System: Leakage Test Engine Stand (LD 280990)	12	1.6

(Continued)

Table C-4 (Continued)

Rank Order of 265 Equipment/Tools/Systems
That 735 Torpedoman's Mates (TM's) Operate, Use, and/or Repair
by Their Frequency of Selection

Equipment/Tools/Systems	No. of TM's Selecting	Percentage of Sample
Lathe	11	1.5
MK-29 Towed Target	11	1.5
Electric Arc Welder	10	1.4
MK-16 System: Afterbody and Exercise Head Leak Test Set MK-259 MOD 1	10	1.4
MK-16 System: Spring Tester (LD 160840)	9	1.2
MK-16 System: Weight, Test Assembly, Depth Mechanism (LD 160827)	8	1.1
MK-30 Towed Target	8	1.1
Transistor Tester	8	1.1
MK-16 System: Air Test Set and Container (LD 287213)	7	1.0
MK-16 System: Gyro Adjusting Stand (LD 41697)	7	1.0
Platform Scale	7	1.0
MK-27 Towed Target	6	.8
Heli-Arc	5	.7
Torpedo Retrieving Assembly (Helicopter)	3	.4

Table C-5

Rank Order of 59 Equipment/Tools/Systems That 2,774 Yeomen (YN's)

Operate, Use, and/or Repair by Their Frequency of Selection

Equipment/Tools/Systems	No. of YN's Selecting	Percentage of Sample
Telephone	2,669	96.2
Electric Typewriter	2,631	94.8
Filing Cabinets	2,572	92.7
Copier (such as 3M, IBM, SCM, Dennison, Xerox)	2,536	91.4
Hole Punch	2,242	80.8
OCR Typewriter (such as IBM Selectric, Olivetti)	2,162	77.9
Safes	1,698	61.2
Mimeograph Machine	1,258	45.3
Vehicles (such as Cars, Pick-up Trucks)	1,252	45.1
Cardex File	951	34.3
Manual Typewriter	876	31.6
Ditto Machine	867	31.2
Inter-Communication (Intercom) Systems	814	29.3
Adding Machine	764	27.5
Seal Stamp (Official Seal)	621	22.4
Magnetic Typewriter (Mag Card I and II)	573	20.6
Shredder	564	20.3
Vacuum Cleaner	497	17.9
Calculator	475	17.1
Addressograph-Multilith Duplicating Machine (such as Offset)	439	15.8
Xerox 7000 (Reduction Capability)	362	13.0
Microfiche Reader	361	13.0
Rotary File	348	12.5
Telecopier (such as Manual, Automatic)	334	12.0
Movie Projector	281	10.1
Overhead Projector	279	10.0
Slide Projector	253	9.1
Tape Recorder (Cassette)	213	7.7
Sequential Numbering Machine	113	4.1
Movie Screen	74	2.7
Lamination Machine	44	1.6
Polaroid Camera		
Magnetic Tape Selectric Typewriter		

AD-A122 028 TAXONOMIC APPROACHES TO ENLISTED OCCUPATIONAL CLASSIFICATION VOLUME II(U) R-K RESEARCH AND SYSTEM DESIGN MALIBU CALIF D M RAMSEY-KLEE DEC 79 2/2

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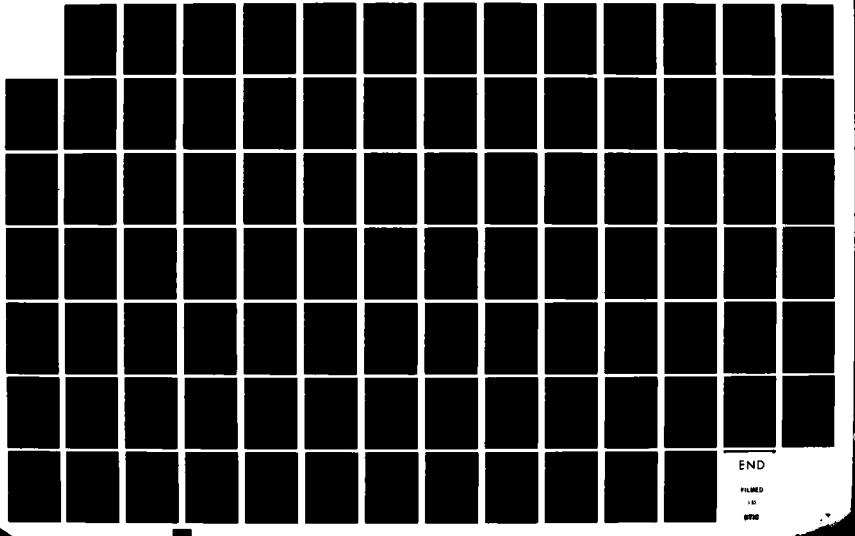

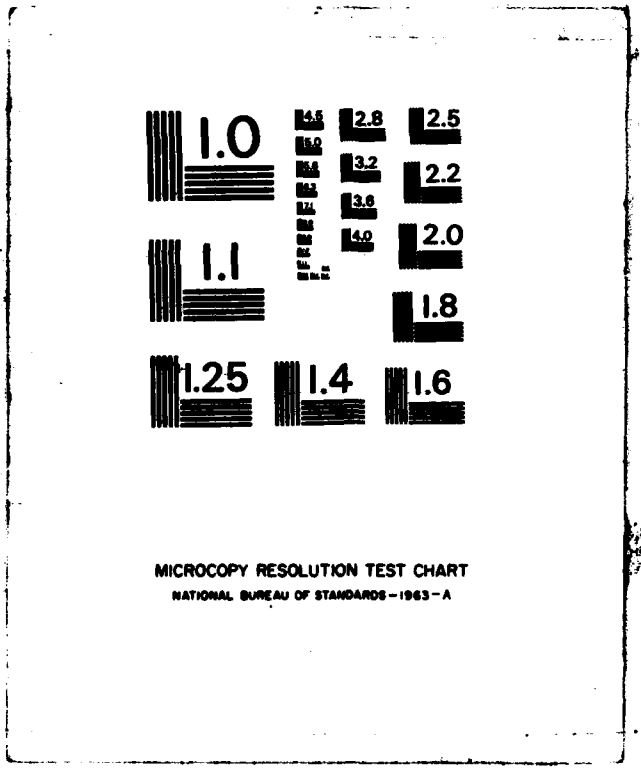
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Table C-5 (Continued)

Rank Order of 59 Equipment/Tools/Systems That 2,774 Yeomen (YN's)

Operate, Use, and/or Repair by Their Frequency of Selection

Equipment/Tools/Systems	No. of YN's Selecting	Percentage of Sample
Stencil Cutting Machine	184	6.6
Transparency Maker	160	5.8
Keypunch Machine	144	5.2
Memory Typewriter	144	5.2
Microfilm Reader/Printer	138	5.0
Leroy Lettering Set	129	4.6
Tone Input Recorder System	129	4.6
Collator	124	4.5
Dictaphone (such as Steno Mask, Steno-Type)	118	4.2
Tape Recorder (Reel to Reel)	108	3.9
Dog Tag Machine	72	2.6
Teletype Machine	66	2.4
Flexowriter	56	2.0
Time Punch Machine	43	1.6
Slide Maker	42	1.5
Postage Meter	37	1.3
Memo Scriber	34	1.2
Digital Computer	31	1.1
Auto-Pen Writer	27	1.0
OPSCAN Machine	27	1.0
Cathode Ray Tube (CRT) Systems (such as Lexitron, Linolex)	21	.8
Wang 2200 System	17	.6
Ozalid Machine	15	.5
Quinn Data Word Processor System	14	.5
"CCI" Computer System	10	.4
"PARS" Terminal/System	8	.3

Table C-5

Rank Order of 59 Equipment/Tools/Systems That 2,774 Yeomen (YN's)

Operate, Use, and/or Repair by Their Frequency of Selection

Equipment/Tools/Systems	No. of YN's Selecting	Percentage of Sample
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Electric Typewriter	2,631	94.8
Filing Cabinets	2,572	92.7
Copier (such as 3M, IBM, SCM, Dennison, Xerox)	2,536	91.4
Hole Punch	2,242	80.8
OCR Typewriter (such as IBM Selectric, Olivetti)	2,162	77.9
Safes	1,698	61.2
Mimeograph Machine	1,258	45.3
Vehicles (such as Cars, Pick-up Trucks)	1,252	45.1
Cardex File	951	34.3
Manual Typewriter	876	31.6
Ditto Machine	867	31.2
Inter-Communication (Intercom) Systems	814	29.3
Adding Machine	764	27.5
Seal Stamp (Official Seal)	621	22.4
Magnetic Typewriter (Mag Card I and II)	573	20.6
Shredder	564	20.3
Vacuum Cleaner	497	17.9
Calculator	475	17.1
Addressograph-Multilith Duplicating Machine (such as Offset)	439	15.8
Xerox 7000 (Reduction Capability)	362	13.0
Microfiche Reader	361	13.0
Rotary File	348	12.5
Telecopier (such as Manual, Automatic)	334	12.0
Movie Projector	281	10.1
Overhead Projector	279	10.0
Slide Projector	253	9.1
Tape Recorder (Cassette)	223	8.0
Sequential Numbering Machine	218	7.8
Movie Screen	197	7.1
Lamination Machine	196	7.1
Polaroid Camera	195	7.0
Magnetic Tape Selectric Typewriter (MTST)	188	6.8

(Continued)

APPENDIX D

ALPHABETICAL DICTIONARY OF THE CATEGORY LABELS USED IN THE CONTENT ANALYSIS

Format: The name of each category label is shown in capital letters at the beginning of the label definition, which may be followed by a "See Also" entry that indicates cross-references to related (but not identical) category labels in other places in the dictionary.

AIRCRAFT FUELING AND LUBRICATION refer to the processes of operating, maintaining, repairing, and testing aircraft fueling/defueling and lubrication systems. Includes fueling/defueling aircraft, fuel trucks, ground support vehicles, and small boats; grounding aircraft and fueling vehicles before fueling, and insuring proper grounding; operating fuel farms, fueling stations, or fueling pits/skids; topping off and venting fuel tanks; taking fuel tank soundings and inventorying fuel reserves; protecting fuel from contamination; cleaning, maintaining, and repairing fuel pumping equipment, hoses, piping, tubing, valves, and nozzles; flushing or purging fuel or oil tanks/cells; examining fuel systems for leaks and testing elements of fueling systems; and lubricating aircraft and maintaining lubrication systems.

AIRCRAFT HANDLING refers to the processes of directing, spotting, moving, hoisting, and securing aircraft, as well as the maintenance and repair of equipment involved in aircraft handling. Includes connecting external power to aircraft and operating the aircraft starting/power unit; directing aircraft using standard aircraft taxi signals, directing movement of aircraft during respot, and directing aircraft onto a catapult for launch; driving/operating spotting dollies; pushing/towing/taxiing aircraft; attaching and removing aircraft tie-downs and protective covers; installing and removing aircraft chocks, blocks, downlocks, jury struts, safety pins, and grounding wires; riding aircraft brakes; jacking aircraft; installing hoisting slings on aircraft, operating the boat and aircraft (B&A) crane, handling lines during aircraft lifting operations, and directing aircraft hoisting operations; and checking, maintaining, repairing, and stowing flight deck elevators.

AIRCRAFT LAUNCH AND RECOVERY refer to aircraft launching (taking off by catapult) and recovery (landing by snagging a wire on the flight deck with a hook on the aircraft) operations. Includes preparing the catapult for launch and examining or testing the catapult for proper operation; maintaining and repairing catapult components; operating and maintaining the jet blast deflector (JBD) and cleaning JBD pits; hooking up bridles and pendants to aircraft for catapult launch; operating the catapult deck edge panel; operating, maintaining, and repairing the retraction engine and its components; checking and testing the bridle arrestor system for proper operation; operating, maintaining, and repairing the bridle arrestor system and its components; operating, maintaining, and repairing the arresting gear (AG) and AG engines; checking the constant run out valve (CROV) drive system for proper operation, and adjusting and repairing CROV drive system components; checking and maintaining the water brake system, repairing components of the water brake system, and cleaning and maintaining water brake tanks; maintaining water cooling systems; building up and rigging barricades, installing and adjusting counter-balance springs on barricade stanchions, and installing tensioning pendants on the barricade winch; applying and removing nonskid to/from wooden and metal decks and aircraft surfaces; installing drag chutes in and removing them from aircraft; and fabricating, preserving, and maintaining nylon lanyards, nylon grommets, cables, wire ropes, bridles, tension bars, and cross-deck pendants.

AIRCRAFT SYSTEMS refer to any aircraft, including its airframe, propulsion machinery, power plant, armament, electrical/electronic/hydraulic/mechanical/pneumatic equipment, and associated support systems. Involves the construction/fabrication, installation, maintenance, operation, troubleshooting, and repair of aircraft systems, including the technical knowledge required to perform these functions. When the specific function is mentioned, use the more specific second-level label to describe it.

AVIATION SUPPORT refers to ground support activities for naval aviation. Includes performing daily or pre-operational checks on ground support equipment (yellow gear); assigning aircraft to flight schedules; preparing aircraft passenger/cargo manifests; issuing aircraft passenger boarding passes; processing embarking/debarking passengers; briefing/debriefing pilot or aircrew; briefing passengers on emergency procedures; issuing survival flight gear and stowing parachutes in aircraft; rigging aircraft for very important people (VIP); reconfiguring aircraft from cargo to passenger; directing the loading of combat personnel in helicopters; unloading patients from MED-EVAC flights; loading and unloading cargo and stores; building up aircraft cargo pallets; directing cargo movements and operating aircraft cargo winches; searching passenger baggage; positioning aircraft boarding ramps/ladders; servicing in-flight kitchens and aircraft sanitation systems; operating runway/ramp sweeper vehicles; painting runway markings and cleaning runway lights; cleaning and painting the flight deck; rigging the manually operated visual landing aid system (MOVLAS); performing minor maintenance on ground support equipment; and adjusting and maintaining Fresnel lenses, adjusting the mirror landing system, and relocating the duty runway LSO/RDO equipment.

BROADCASTING SYSTEMS refer to equipment and systems for transmitting programs or events by radio, television, or public address, such as television receivers, closed-circuit television (CCTV) systems, community antenna television (CATV) systems, TV studio/distribution systems, ships' audio entertainment systems, and public address (PA) systems. Involves the installation, maintenance, troubleshooting, and repair of these systems. When the specific function is mentioned, use the more specific second-level label to describe it.

CHAPLAIN SUPPORT refers to clerical job duties involved in the support of Navy chaplains such as arranging spaces or areas for church services; typing church services bulletins, chaplains' watch bills, choir rosters, and religious documents; maintaining the chapel log of events, ecclesiastical supplies, and chaplains' interview records; and depositing chapel funds.

CLERICAL FUNCTIONS refer to clerical job duties involved in the routine operation of an office. Includes taking dictation; typing correspondence (letters, messages, memoranda), forms, reports, recommendations, invoices, contracts, agreements, speeches, etc.; preparing and routing correspondence, orders, and requests; placing phone calls and answering the telephone; taking and logging trouble calls; preparing, maintaining, and updating files, logs, records, lists, indexes, plans, schedules, notebooks, workbooks, diaries, biographies, rosters, and directories; controlling/issuing keys, ID cards, badges, passes, parking spaces/permits, and vehicle decals; maintaining, checking, and computing time cards/sheets; computing leave and travel time; arranging billeting or berthing requirements; and arranging for briefings, conferences, and ceremonies.

Typing correspondence and speeches would be considered CLERICAL FUNCTIONS. However, *drafting* or *writing* correspondence and speeches would be considered COMMUNICATION.

Typing, *maintaining*, or *updating* plans and schedules would be considered CLERICAL FUNCTIONS. However, *creating* plans and schedules would be considered PLANNING.

COMMUNICATION refers to the expression of thoughts and feelings through the spoken or written word, and its use in the exchange of information within an organization. Includes public speaking, briefings, and drafting or writing letters, documents, and speeches; providing consultations; and conducting opinion surveys.

Conducting a meeting, seminar, or conference, or *giving* a briefing would be considered COMMUNICATION in that an active role is being taken to exchange information. However, because of the possibly passive role that mere attendance at a gathering might imply, *attending* a briefing, meeting, seminar, or conference would be considered MEETINGS, SEMINARS, AND CONFERENCES.

Drafting or *writing* correspondence and speeches would be considered COMMUNICATION. However, *typing* correspondence and speeches would be considered CLERICAL FUNCTIONS.

See Also: COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS;
INFORMATION RELEASE/PROMULGATION

COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS refer to equipment and systems for transmitting and receiving information from one point, person, or equipment to another as well as devices for translating plain text into cipher and for deciphering codes and ciphers, such as internal communications (intercomm) equipment, headsets/handsets, VHF/UHF communications equipment, satellite communications (SATCOMM) and tactical satellite communications (TACSATCOMM) systems, communications antenna systems, antenna stabilization

systems, communications remotes and communications (COMM) patching facilities, mobile and portable transceivers, multiplex systems, VLF/LF/HF transmitters and receivers, microwave systems, infrared equipment, teletypewriters (TTY's), facsimile (FAX) systems, and secure equipments/systems. Involves the installation, maintenance, troubleshooting, and repair of these systems. When the specific function is mentioned, use the more specific second-level label to describe it.

See Also: COMMUNICATION

CONDUCT OF TRAINING refers to the application of training procedures and programs in the classroom environment. Includes conducting classroom lectures or training, administering and grading tests/examinations, disseminating examination results, and training instructors.

CONSTRUCTION/FABRICATION OF AIRCRAFT SYSTEMS refers to the process of constructing or fabricating any component of an aircraft system. Includes cutting metal using oxygen-acetylene equipment and designing/making special tools or equipment that are to be used in the construction or fabrication of aircraft systems.

CONSTRUCTION/FABRICATION OF ELECTRIC/ELECTRONIC EQUIPMENT refers to the process of constructing or fabricating any piece of electrical and electronic equipment or the components of such equipment. Includes constructing cable harnesses, fabricating coaxial cables and wiring harnesses, and assembling cables and test leads.

CONSTRUCTION/FABRICATION OF WEAPON AND MISSILE SYSTEMS refers to the process of constructing or fabricating any component of a weapon or missile system. Includes construction of low or high pressure flexible hoses.

CONTROLLING refers to assuring the accomplishment of plans by measuring performance against established standards, goals, or objectives and correcting deviations or taking action that prevents deviations from occurring. Includes budgets, checks and balances, quality assurance checks, audits, and routine inspections. Actions that typically are assigned this label are advising, approving/disapproving, authorizing, controlling, ensuring, evaluating, investigating, monitoring, recommending, reviewing, screening, signing off, and verifying.

Conducting a drill or inspection would be considered CONTROLLING in that the drill or inspection is designed to assess if established standards are met and to correct any deviation from these standards. However, *attending*

a drill or inspection would be considered DRILLS, INSPECTIONS, AND COMMAND MILITARY FUNCTIONS. Conducting a *safety* inspection would be considered SAFETY.

Reviewing enlisted and civilian performance evaluations written by others would be considered CONTROLLING in that the review process is designed to ensure that the evaluations have been made according to established standards. However, *writing* a performance evaluation for an enlisted subordinate or a civilian employee would be considered LEADERSHIP AND SUPERVISION.

CORROSION CONTROL AND MATERIAL PRESERVATION refer to the processes of controlling aircraft corrosion and preserving aircraft surfaces, components, and parts. Includes examining aircraft for corrosion; removing corrosion chemically or mechanically; chemically treating metal after corrosion removal; repairing holes or cracks on aircraft using lap patch; applying preservative to aircraft; "rust licking" jet engines; stripping paint from and preparing aircraft surfaces for painting; masking aircraft for painting; painting aircraft surfaces, components, and parts; and laying out aircraft markings and applying aircraft decals.

DAMAGE CONTROL refers to the measures necessary to preserve and re-establish shipboard watertight integrity, stability, maneuverability, and offensive power; to control list and trim; to make rapid repairs of materiel; to limit the spread of and provide adequate protection from fire; to limit the spread of, remove the contamination by, and provide adequate protection from toxic agents; and to provide for care of wounded personnel. Includes maintaining assigned space damage control systems; checking alarm and ventilating systems; monitoring and performing tests for detection of toxic environmental pollution; identifying and handling hazardous materials; neutralizing contaminating spillage and cleaning up spills; disposing of or decontaminating contaminated materials and equipment; maintaining and repairing fire fighting equipment; replenishing fire fighting stations and crash equipment with fire fighting agents; standing by aircraft on emergency equipment or with fire bottles during fueling/defueling/starting/hot brakes/hot refuel; operating foam/light water stations, crash trucks/ trailers, and crash and salvage cranes; fighting aircraft/fuel/weapons fires; and rescuing personnel from burning/crashed aircraft.

See Also: SAFETY

DATA PROCESSING/COMPUTING EQUIPMENT refers to data processing and computing equipment, their sections, their digital logic units, and their peripheral devices, such as printers, punched tape and card units, magnetic tape units, and data terminal sets. Involves the operation, troubleshooting, and preventive maintenance of this equipment. When the specific function is mentioned, use the more specific second-level label to describe it.

See Also: INFORMATION RETRIEVAL AND DATA ANALYSIS

DRILLS, INSPECTIONS, AND COMMAND MILITARY FUNCTIONS refer to the requirement to attend exercises such as general quarters drills, inspections, officer's call, and command military functions as part of one's general or military job duties.

Attending a drill or inspection would be considered DRILLS, INSPECTIONS, AND COMMAND MILITARY FUNCTIONS. However, *conducting* a drill or inspection would be considered CONTROLLING in that the drill or inspection is designed to assess if established standards are met and to correct any deviations from these standards.

ELECTRIC/ELECTRONIC EQUIPMENT refers to the construction/fabrication, installation, maintenance, troubleshooting, and repair of electric and electronic equipment, including the technical knowledge required to perform these functions. When the specific function is mentioned, use the more specific second-level label to describe it.

ELECTRONIC WARFARE refers to a form of warfare carried on to eliminate or reduce the threat from or effectiveness of enemy electronic equipment. Includes cleaning, lubricating, adjusting, and aligning electronic countermeasures (ECM) and electronic support measures (ESM) equipment; removing and replacing components of ECM and ESM equipment; and testing and troubleshooting ECM and ESM equipment to the major component or subsystem level or to the failed circuit part.

GENERAL/MILITARY DUTIES refer to those job duties required as part of one's general or military assignments such as damage control; attending drills, inspections, and command military functions; being a member of or providing support to a landing party; attending meetings, seminars, and conferences; seamanship; standing watch; and participating in work details or working parties. When the specific job duty is mentioned, use the more specific second-level label to describe it.

GRAPHICS SUPPORT refers to the job duties of designing and drawing artwork (such as letterheads, charts, covers, invitations, and animations); preparing slides, transparencies, graphs, and charts; and taking official photographs.

HYDRAULIC/PNEUMATIC MAINTENANCE refers to the process of holding or keeping in a state or condition of efficiency, preparedness, or cleanliness hydraulic or pneumatic systems and their components. This term is to be

used when the hydraulic or pneumatic system mentioned is unassociated with the particular system environment in which it is embedded. If the hydraulic or pneumatic system is mentioned in the context of the larger system entity of which it is a part but the reference is clearly to the hydraulic or pneumatic system specifically, then this label should be used also. The following examples would be assigned this label: perform volumetric checks on or adjust relief valve on hydraulic pumps, clean hydraulic filters, service hydraulic reservoirs, bleed air from or troubleshoot hydraulic systems, maintain torpedo tube hydraulic systems, drain condensation from or charge pneumatic systems, service pneumatic system storage bottles, overhaul and repair pneumatic actuated valves, and service weapons pneumatic systems.

INFORMATION RELEASE/PROMULGATION refers to the job duties of announcing, releasing, reproducing, distributing, and promulgating information. Includes preparing, maintaining, and updating announcements, notices, bulletins, news releases, newspapers, instructions, information guides, manuals, publications, posters, bulletin boards, status boards, picture boards, and "required reading" boards. Job duties in this area also involve preparing and maintaining distribution lists, preparing multilith masters and stencils, reproduction and printing, preparing replies to Congressional inquiries, ordering publications, and maintaining libraries.

See Also: COMMUNICATION

INFORMATION RETRIEVAL AND DATA ANALYSIS refer to the job duties of retrieving information from computer systems, and analyzing data and computer output.

See Also: DATA PROCESSING/COMPUTING EQUIPMENT

INSTALLATION OF AIRCRAFT SYSTEMS refers to the process of installing, setting up, or locating for use or service aircraft systems. Includes installing tension bars (T-bars) in aircraft and installing engines on test beds/stands.

INSTALLATION OF BROADCASTING SYSTEMS refers to the process of installing, setting up, or locating for use or service broadcasting equipment or systems. Includes setting up public address (PA) systems for command functions such as inspections and presentations.

INSTALLATION OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS refers to the process of installing, setting up, or locating for use or service communications and cryptographic systems. Includes installing mobile transceivers.

INSTALLATION OF ELECTRIC/ELECTRONIC EQUIPMENT refers to the process of installing, setting up, or locating for use or service equipment that is electrical or electronic in nature. Includes installing connectors, wire dispensers and housings, battery power supplies, and electrolyte in batteries; installing or relocating circuits in DC patch boards; installing special projects alterations on assigned equipment; installing field changes in electronic equipment; and installing modifications specified in electronic equipment IAW electronics information bulletins (EIB's).

INSTALLATION OF RADAR/SONAR SYSTEMS refers to the process of installing, setting up, or locating for use or service radar and sonar systems. Includes installing corner reflectors.

INSTALLATION OF WEAPON AND MISSILE SYSTEMS refers to the process of installing components of military weapons and missiles. Includes installing air stabilizers (parapacks) on weapons, weapons umbilical cables and explosive devices, torpedo handling adapters, and exercise heads and warheads on the MK 14/16 torpedo.

KNOWLEDGE OF AIRCRAFT SYSTEMS refers to the possession of technical knowledge necessary to read/interpret/use blueprints, schematic diagrams, and assembly drawings; to take readings such as dynamometer, stack height, inertness at coffer dam, temperature of Fresnel lenses, cylinder elongation, power cylinder gap, and aircraft accelerometer (G-meter); to record engine readings during high/low power runs; to convert soundings to gallons and engine readings to "standard-day" parameters; to make up charts or graphs; and to research publications or instructions for technical information.

KNOWLEDGE OF ELECTRIC/ELECTRONIC EQUIPMENT refers to the possession of technical knowledge necessary to identify standard electrical/electronic components and symbols; to read and use schematic and logic diagrams, and troubleshooting flow charts and tables for fault isolation; to analyze circuits using qualitative and quantitative analysis; to mathematically compute XL and XC, total circuit resistance, and frequency; and to research technical publications for troubleshooting or maintenance information.

KNOWLEDGE OF RADAR/SONAR SYSTEMS refers to the possession of technical knowledge necessary to record one's own ship's radar parameters such as voltage standing-wave ratio (VSWR), power out, and pulse-repetition frequency (PRF).

KNOWLEDGE OF WEAPON AND MISSILE SYSTEMS refers to the possession of technical knowledge necessary to identify component symbols, read/interpret blueprints and indicators, and develop torpedo run films.

LANDING PARTY refers to a nominal force of infantry from the ship's company equipped and organized to perform field functions ashore, to police an area during an emergency, and to take part in parades or ceremonies. This force is maintained by the weapons officer.

LEADERSHIP AND SUPERVISION refer to the motivating, guiding, and supervising of subordinates to accomplish a job and to work toward improved performance. Involves encouraging subordinates in cooperative endeavors and also in self-development through counseling. Includes making work and watch assignments; filling out work requests/work orders; preparing and updating watch, quarter, station, and recall bills; mustering personnel; ensuring that work assigned to subordinates is completed; counseling/assisting personnel on education and training opportunities, on career development programs, on requirements for advancement, and on officer programs; recommending personnel for formal training, advancement in rate, and for special programs; and evaluating the performance of subordinates and civilian employees.

Writing a performance evaluation for an enlisted subordinate or a civilian employee would be considered LEADERSHIP AND SUPERVISION. However, *reviewing* performance evaluations written by others would be considered CONTROLLING in that the review process is designed to ensure that the evaluations have been made according to established standards.

See Also: PERSONNEL SUPPORT

LEGAL/DISCIPLINARY SUPPORT refers to the clerical support provided to legal and disciplinary bodies and activities such as fact-finding bodies, courts of inquiry, boards of investigation, pre-trial investigations, Captain's Mast, and Courts Martial. Includes preparing and typing legal or disciplinary documents and correspondence; recording, transcribing, and typing the proceedings of legal or disciplinary bodies; court reporting; processing admiralty claims; maintaining the unit punishment book and correction center disciplinary log; authenticating legal documents or proceedings; and disseminating the results of Captain's Masts and the record of trial or fact-finding body proceedings.

LOGISTICS refers to the procurement, storage, distribution, return, and replacement of materiel and supplies. Includes acknowledgment and assessment of the quality and quantity of materiel and supplies received; determination of lost/damaged equipment, materiel or supplies, or expendable materials; and inventories or surveys of equipment, parts, tools, supplies, and controlled equipage. Also included here are maintaining and updating equipment/parts lists (e.g., AEL, MRS, and COSAL) and supply logs; researching technical publications for Federal stock numbers and part numbers; making SERVMART, SEAMART, or SUBMART runs; packing equipment for shipment, storage, or turn-in to supply; repairing and maintaining shipping containers; cutting stencils for marking material for shipment; placing identifying marks on tools or equipment; turning in equipment for repair; and maintaining liaison with supply depots. All record keeping associated with logistic support is included here also such as equipment history cards, field equipment changes cards, and equipment statistical data (ESD) cards; transaction reports; and daily and monthly equipment status, usage, and availability reports.

MAINTENANCE OF AIRCRAFT SYSTEMS refers to the process of holding or keeping in a state or condition of efficiency, preparedness, or cleanliness aircraft systems. Includes cleaning, washing, and polishing of aircraft, aircraft windshields or canopies, and aircraft engines; cleaning and flushing lines; and adjusting, aligning, calibrating, examining, checking, tightening, rigging, and servicing components of aircraft systems. Other maintenance functions are balancing propellers and tail rotor assemblies, timing reciprocating engines, and blending power turbine blades and compressor rotor blades. Preventive maintenance is included here also.

MAINTENANCE OF BROADCASTING SYSTEMS refers to the process of holding or keeping in a state or condition of efficiency, newness, or proper working order broadcasting equipment or systems and their components. Includes adjusting and aligning television receivers, closed-circuit television (CCTV) and community antenna television (CATV) system components, and the components of TV studio/distribution systems and ships' audio entertainment systems. Preventive maintenance is included here also.

MAINTENANCE OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS refers to the process of holding or keeping in a state or condition of efficiency, newness, or cleanliness communications and cryptographic equipment or systems and their components. Includes cleaning, lubricating, adjusting, aligning, and servicing intercomm equipment, headsets/handsets, VHF/UHF communications equipment, SATCOMM and TACSATCOMM systems, communications antenna systems, antenna stabilization systems, communications remotes and COMM patching facility components, mobile and portable transceivers, multiplex systems, VLF/LF/HF transmitters and receivers, microwave systems, infrared equipment, teletypewriters (TTY's), facsimile (FAX) systems, and secure equipments/systems. Preventive maintenance is included here also.

MAINTENANCE OF DATA PROCESSING/COMPUTING EQUIPMENT refers to the process of holding or keeping in a state or condition of efficiency, newness, or cleanliness data processing and computing equipment. Includes performing preventive maintenance on the computer input/output section, memory section, control section, arithmetic section, computer machine control signal units, and computer buffer equipments; on digital AND/OR/NAND/NOR gates, digital counters/registers, digital adders/subtractors, digital comparators, digital decoders, digital matrices, digital logic flip flop circuits; on logic families and positive and negative logic devices; and on computer peripheral devices such as printers, punched tape and card units, magnetic tape units, and data terminal sets.

See Also: MAINTENANCE OF OFFICE EQUIPMENT

MAINTENANCE OF ELECTRIC/ELECTRONIC EQUIPMENT refers to the process of holding or keeping in a state or condition of efficiency, newness, or cleanliness equipment that is electric or electronic in nature. Includes cleaning, lubricating, adjusting, aligning, tuning, calibrating, presetting, examining, checking, and servicing electrical or electronic equipment. Preventive maintenance and the Planned Maintenance System (PMS) is included here also.

MAINTENANCE OF NAVIGATION SYSTEMS refers to the process of holding or keeping in a state or condition of efficiency, preparedness, or proper working order navigation systems and their components. Includes adjusting and aligning the shipboard Long Range Navigation (LORAN) system; the OMEGA receiving set and satellite navigation receivers; components of radio direction finding (RDF) equipment, of the Ship's Inertial Navigation System (SINS), and of the Tactical Air Navigation (TACAN) system and its antenna; and navigation computers. Preventive maintenance is included here also.

MAINTENANCE OF OFFICE EQUIPMENT refers to the process of holding or keeping in a state or condition of efficiency, newness, or cleanliness office equipment. Includes cleaning, lubricating, and making minor adjustments to typewriters and reproduction machines.

See Also: MAINTENANCE OF DATA PROCESSING/COMPUTING EQUIPMENT

MAINTENANCE OF RADAR/SONAR SYSTEMS refers to the process of holding or keeping in a state or condition of efficiency, preparedness, or cleanliness radar or sonar systems and their components. Includes cleaning, lubricating, adjusting, aligning, and servicing radar indicators; radar signal distribution systems; radar antenna motion systems; air and surface search radar systems; Ground Controlled Approach (GCA) and Carrier Controlled Approach (CCA) radar systems; weather radar; Identification, Friend or Foe (IFF) radar; and fathometers. Preventive maintenance is included here also.

MAINTENANCE OF WEAPON AND MISSILE SYSTEMS refers to the process of holding or keeping in a state or condition of efficiency or preparedness military weapons and missiles, along with their associated transporting vehicles. Includes cleaning, sterilizing, lubricating, adjusting, aligning, altering, calibrating, pre-setting, regulating, examining, checking, servicing, and refurbishing small arms and components of weapon and missile systems. Preventive maintenance is included here also.

MAINTENANCE OF WEATHER SYSTEMS refers to the process of holding or keeping in a state or condition of efficiency, preparedness, or proper working order weather systems and their components. Includes adjusting, aligning, calibrating, and servicing anemometers, barometers, cloud height sets, radiosonde receptors, weather vision systems, and weather satellite receiver-recorder systems. Preventive maintenance is included here also.

MANAGEMENT FUNCTIONS refer to those job duties which are characteristic of all managers: communication, controlling, leadership and supervision, organization, planning, reporting, representation, and staffing. Though operations may differ from one organization to another, the functions of the manager are common to all. When the specific managerial function is mentioned, use the more specific second-level label to describe it.

See Also: OFFICE MANAGEMENT

MECHANICAL MAINTENANCE refers to the process of holding or keeping in a state or condition of efficiency, cleanliness, or proper working order mechanical components and the tools used in mechanical maintenance. This label is to be used when the mechanical maintenance mentioned is unassociated with the particular system environment in which it is embedded. If the mechanical maintenance is mentioned in the context of the larger system entity of which it is a part but the reference is clearly to the mechanical maintenance itself, then this label should be used also. The following examples would be assigned this label: adjust pressure regulators, mechanical linkages, and gear trains; align flexible couplings on motor and pump assemblies; tighten loose screws and fittings; clean/repack bearings, valves, and cylinders; hone cylinder walls; replace gaskets and seals; replace common hardware; remove/replace spark plugs, valves, tubing, and hoses; weld metals using oxy-acetylene, electric arc, or heli-arc equipment; overhaul and repair mechanical depth mechanisms and steering units; calibrate gauges and torque wrenches; and clean and preserve tools.

MEETINGS, SEMINARS, AND CONFERENCES refer to the requirement to *attend* prescribed gatherings of individuals for the exchange of information as part of one's general or military duties.

Conducting a meeting, seminar, or conference, or *giving* a briefing would be considered COMMUNICATION in that an active role is being taken to exchange information as opposed to the possibly passive role that mere attendance at a gathering might imply.

NAVAL AVIATION OPERATIONS refer to the activities involved in supporting ground-based and carrier-based naval aviation. Involves aircraft fueling and lubrication, aircraft handling, aircraft launch and recovery, and aviation support. When the specific function is mentioned, use the more specific second-level label to describe it.

NAVIGATION SYSTEMS refer to equipment and systems for planning, recording, and controlling the course and position of a ship or aircraft, such as the shipboard Long Range Navigation (LORAN) system, the OMEGA receiving set and satellite navigation receivers, radio direction finding (RDF) equipment, the Ship's Inertial Navigation System (SINS), the Tactical Air Navigation (TACAN) system and its antenna, and navigation computers. Involves the maintenance, troubleshooting, and repair of these systems. When the specific function is mentioned, use the more specific second-level label to describe it.

OFFICE MANAGEMENT refers to the clerical, secretarial, and administrative job duties involved in managing and operating an office. Involves chaplain support, clerical functions, graphics support, information release and promulgation, information retrieval and data analysis, legal and disciplinary support, maintenance of office equipment, operation of office equipment, personnel support, and support for social functions. When the specific function is mentioned, use the more specific second-level label to describe it.

See Also: MANAGEMENT FUNCTIONS

ON-THE-JOB TRAINING refers to instructing personnel in proper testing and troubleshooting procedures and techniques, and the proper use and operation of equipment while on the job.

OPERATION OF AIRCRAFT SYSTEMS refers to the process of operating, causing to function, or monitoring the operational performance of aircraft systems.

OPERATION OF DATA PROCESSING/COMPUTING EQUIPMENT refers to the process of operating, causing to function, or using data processing and computing equipment. Includes entering information into computer systems.

See Also: OPERATION OF OFFICE EQUIPMENT

OPERATION OF OFFICE EQUIPMENT refers to the process of operating, causing to function, or using office equipment. Includes operating or using overhead, opaque, or slide projectors; typing word processing card/tape roughs and smooths; and proofreading and editing material produced by word processing cards/tapes.

See Also: OPERATION OF DATA PROCESSING/COMPUTING EQUIPMENT

OPERATION OF RADAR/SONAR SYSTEMS refers to the process of operating or causing to function radar or sonar equipment and systems.

OPERATION OF WEAPON AND MISSILE SYSTEMS refers to the process of operating or causing to function military weapons and missiles. Includes operating weapons transporting vehicles, fork lifts, and capstans; loading and unloading weapons to/from their transport vehicles and launchers; assembling and disassembling weapons sections and their stowage racks; breaking out and stowing torpedo handling equipment and fully assembled weapons; pressurizing/depressurizing or fueling/defueling assembled weapons and warheads; preparing the complete torpedo; converting torpedos from a modified to a fully ready state; handling and firing slugs, pyrotechnic devices, torpedos, and missiles; recording magazine temperatures; participating in torpedo recovery; and performing post-run procedures.

ORGANIZATION refers to the establishment of an intentional structure of roles through the determination and enumeration of activities required to achieve enterprise goals such as grouping activities and roles, delegating authority, and coordinating authority relationships and activities. Includes ensuring the readiness of the command for inspections; coordinating work within the division; coordinating activities within one's own command and with higher commands; coordinating work schedules with other work centers, other activities, and other ratings; coordinating with military activities or public works for required maintenance; coordinating with civilian activities for technical assistance or equipment maintenance; and any other coordination efforts.

PERSONNEL SUPPORT refers to the job duties of counseling and assisting personnel on military and personal matters such as military pay and allowances; leave procedures; transfers and overseas assignments; household goods shipments; preparation of travel vouchers; the legal assistance program; humanitarian/hardship (HUMS) matters; insurance (USGLI); the survivor benefit plan; separations, retirements, and reenlistments; Major Care 90; and VA benefits. Also includes researching, routing, and readdressing Casualty Assistance Calls Program (CACP) messages; and maintaining and closing out the CACP active case file.

See Also: LEADERSHIP AND SUPERVISION

PLANNING refers to the decision-making process involving the selection among alternatives of objectives, policies, and programs; and the means for achieving and assuring the accomplishment of plans. Includes planning and organizing the physical layout of working space; assigning workload or job priorities; evaluating operational commitments to predict and schedule workloads; reviewing manpower requirements; and determining the most cost-effective means, for example, of office operations, of printing/reproduction, or of procuring open purchase items.

Creating plans and schedules would be considered PLANNING. However, *typing*, *maintaining*, or *updating* plans and schedules would be considered CLERICAL FUNCTIONS.

RADAR/SONAR SYSTEMS refer to Radio Detection and Ranging (RADAR) and Sound Navigation and Ranging (SONAR) equipment and systems, such as radar indicators; radar signal distribution systems; radar antenna motion systems; air and surface search radar systems; Ground Controlled Approach (GCA) and Carrier Controlled Approach (CCA) radar systems; weather radar; Identification, Friend or Foe (IFF) radar; and sonar sounding sets (fathometers). Involves the installation, maintenance, operation, troubleshooting, and repair of these systems, including the technical knowledge required to perform these functions. When the specific function is mentioned, use the more specific second-level label to describe it.

REPAIR OF AIRCRAFT SYSTEMS refers to the process of restoring aircraft systems to working condition by removing defective components and replacing them with properly functioning substitutes, or by repairing the faulty component so as to cause it to function properly. Includes removing/replacing, repairing, and overhauling aircraft systems.

REPAIR OF BROADCASTING SYSTEMS refers to the process of restoring broadcasting systems to working condition by removing defective components and replacing them with properly functioning substitutes, or by repairing the

faulty component so as to cause it to function properly. Includes removing/replacing components of television receivers, closed-circuit television (CCTV) systems, community antenna television (CATV) systems, ships' audio entertainment systems, and public address (PA) systems.

REPAIR OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS refers to the process of restoring communications and cryptographic systems to working condition by removing defective components and replacing them with properly functioning substitutes, or by repairing the faulty component or subsystem so as to cause it to function properly. Includes removing/replacing components of intercomm equipment, headsets/handsets, VHF/UHF communications equipment, SATCOMM and TACSATCOMM systems, communications antenna systems, antenna stabilization systems, communications remotes and COMM patching facilities, mobile and portable transceivers, multiplex systems, VLF/LF/HF transmitters and receivers, microwave systems, infrared equipment, teletypewriters (TTY's), and facsimile (FAX) systems, and secure equipments/systems.

REPAIR OF ELECTRIC/ELECTRONIC EQUIPMENT refers to the process of restoring electrical and electronic equipment to working condition by removing defective components and replacing them with properly functioning substitutes, or by repairing the faulty component so as to cause it to function properly. Includes removing/replacing, repairing, and overhauling electric and electronic equipment.

REPAIR OF NAVIGATION SYSTEMS refers to the process of restoring navigation systems to working condition by removing defective components and replacing them with properly functioning substitutes, or by repairing the faulty component or subsystem so as to cause it to function properly. Includes removing/replacing components of the shipboard Long Range Navigation (LORAN) system, the OMEGA receiving set and satellite navigation receivers, radio direction finding (RDF) equipment, the Ship's Inertial Navigation System (SINS), the Tactical Air Navigation (TACAN) system and its antenna, and navigation computers.

REPAIR OF RADAR/SONAR SYSTEMS refers to the process of restoring radar and sonar systems to working condition by removing defective components and replacing them with properly functioning substitutes, or by repairing the faulty component or subsystem so as to cause it to function properly. Includes removing/replacing components of radar indicators; radar signal distribution systems (such as video and trigger amps and switchboards); radar antenna motion systems (such as rotate and scan); air and surface search radar systems; Ground Controlled Approach (GCA) and Carrier Controlled Approach (CCA) radar systems; weather radar; Identification, Friend or Foe (IFF) radar; and fathometers.

REPAIR OF WEAPON AND MISSILE SYSTEMS refers to the process of restoring military weapon and missile systems to working condition by removing defective components and replacing them with properly functioning substitutes, or by repairing the faulty component so as to cause it to function properly. Includes annealing, soldering, removing/replacing, repairing, and overhauling.

REPAIR OF WEATHER SYSTEMS refers to the process of restoring weather systems to working condition by removing defective components and replacing them with properly functioning substitutes, or by repairing the faulty component or subsystem so as to cause it to function properly. Includes removing/replacing and repairing barometers and components of anemometers, radiosonde receptors, and weather satellite receiver-recorder systems.

REPORTING refers to writing, preparing, or providing an account (usually in an established form) to senior officers of information needed for management decision making. Included here are all personnel and status reports. Use LOGISTICS for transaction reports that cover equipment, tools, and supplies.

REPRESENTATION refers to the creation of an image of an organization to the external or internal environment. An organizational unit's image affects its working relationship with other organizational units within the U.S. Navy and/or with the community outside of the organizational structure. Includes representing the command at conferences and meetings, serving as a member of a command board or a committee, maintaining liaison with military/civilian activities, maintaining liaison with other divisions or departments to insure smooth working relationships, providing technical assistance to other work centers, and performing escort or tour guide duties.

SAFETY refers to safety precautions and procedures as well as to their promulgation and enforcement. Includes posting and distributing safety material; ensuring compliance with safety messages and directives; making safety inspections and acting as safety observer; installing safety wire; painting safety markings on the flight deck and repairing/replacing safety nets; maintaining flight deck protective clothing; certifying aircraft safe for flight; investigating aircraft and nonaviation accidents or incidents; conducting engineering investigations of failed aircraft engines; investigating ground support equipment handling violations; and performing weapons accidental activation procedures (jettison or disarm), emergency defueling procedures on weapons, and weapons abort procedures.

Conducting a *safety* inspection would be considered SAFETY. Inspections conducted to *assess if established standards are met* and to *correct any deviations from these standards* would be considered CONTROLLING.

See Also: DAMAGE CONTROL

SEAMANSHIP refers to knowledge of and skill in managing or navigating a boat or ship.

SECURITY refers to the safeguarding of classified information, materials, weapons, and techniques as well as the physical security of ships and stations. Includes organizing departmental/division security; testing security alarm systems; typing classified messages, letters, and the command access clearance listing; maintaining inventories and logs of classified material, directives, reading folders/files, and secure voice communications; changing lock/safe combinations and maintaining safe documentation forms and inventories; preparing and packaging classified material for mailing; briefing/debriefing personnel on security procedures/policies; assigning downgrading/declassification markings; destroying classified material in accordance with current instructions; preparing classified material destruction reports; and standing security watches or guards.

Standing a *security* watch would be considered SECURITY. The duty of standing *any other watch* would be considered WATCH STANDING.

SOCIAL FUNCTIONS SUPPORT refers to job duties in support of social functions such as making arrangements for luncheons and parties, planning and coordinating social functions, preparing official social invitations and replies, and preparing and maintaining social rosters and RSVP guest lists.

STAFFING refers to the manning of and keeping manned the positions provided for by the organization structure. Includes writing billet/job descriptions, initiating action to obtain required personnel, making personnel assignments, reviewing records to determine personnel qualifications, qualifying/requalifying personnel, monitoring enlisted and officer manning levels, and reviewing and recommending changes to the manpower authorization list.

TRAINING ADMINISTRATION refers to those actions involved in administering training programs and procedures. Includes reviewing or screening lesson/instructor guides for accuracy and completeness; approving course content, practical factors, and personnel qualification standards (PQS); scheduling training and assigning instructors; monitoring training programs and administering feedback reports for the purpose of updating training; preparing, maintaining, and updating training reports and records; preparing requests for and issuing/controlling school quotas; ordering tests, examinations, training publications, and training manuals; typing student grade reports, requests for advancement examination waivers, VA forms pertaining to education, and college admission/acceptance letters; maintaining pilot/NFO training jackets; and processing student enrollments, disenrollments, and graduations.

TRAINING AND EDUCATION refer to those functions involved in the training or educational process: conduct of training, on-the-job training, training administration, and training development. When the specific training function is mentioned, use the more specific second-level label to describe it.

TRAINING DEVELOPMENT refers to the development, maintenance, and updating of training curricula, materials, and programs. Includes writing and updating curriculum outlines, lesson/instructor guides, courses of study, training lectures and materials, and tests/examinations; constructing training aids and devices; conducting on-site job/skill/task analysis; and preparing learning objectives based on on-site job/skill/task analysis.

TROUBLESHOOTING OF AIRCRAFT SYSTEMS refers to the process of locating malfunctions in aircraft systems by methodical procedures. Includes making measurements and doing computations; performing pre-operational checks; conducting tests and test cell runs; and isolating component faults, failures, and malfunctions.

TROUBLESHOOTING OF BROADCASTING SYSTEMS refers to the process of locating malfunctions in broadcasting systems by methodical procedures. Includes performing tests and isolating equipment faults and failures to the subsystem level, to the major component level, and to the failed circuit part in television receivers, closed-circuit television (CCTV) systems, community antenna television (CATV) systems, TV studio/distribution systems, ships' audio entertainment systems, and public address (PA) systems.

TROUBLESHOOTING OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS refers to the process of locating malfunctions in communications and cryptographic systems by methodical procedures. Includes performing tests and isolating equipment faults and failures to the subsystem level, to the major component level, and to the failed circuit part in intercomm equipment, headsets/handsets, VHF/UHF communications equipment, SATCOMM and TACSATCOMM systems, communications antenna systems, antenna stabilization systems, communications remotes and COMM patching facilities, mobile and portable transceivers, multiplex systems, VLF/LF/HF transmitters and receivers, microwave systems, infrared equipment, teletypewriters (TTY's), facsimile (FAX) systems, and secure equipments/systems.

TROUBLESHOOTING OF DATA PROCESSING/COMPUTING EQUIPMENT refers to the process of locating malfunctions in data processing and computing equipment, and isolating equipment faults and failures. Includes troubleshooting the computer input/output section, memory section, control section, arithmetic section, computer machine control signal units, and computer buffer equipments; digital AND/OR/NAND/NOR gates, digital counters/registers, digital adders/subtractors, digital comparators, digital decoders, digital matrices, digital logic flip flop circuits; logic families and positive and negative logic devices, and computer peripheral devices such as printers, punched tape and card units, magnetic tape units, and data terminal sets.

TROUBLESHOOTING OF ELECTRIC/ELECTRONIC EQUIPMENT refers to the process of locating malfunctions in electrical or electronic equipment by methodical procedures. Includes making measurements, designing and performing tests, carrying out diagnostic checks and programs, and isolating equipment faults and failures.

TROUBLESHOOTING OF NAVIGATION SYSTEMS refers to the process of locating malfunctions in navigation systems by methodical procedures. Includes performing tests and isolating equipment faults and failures to the subsystem level, to the major component level, and to the failed circuit part in the shipboard Long Range Navigation (LORAN) system, the OMEGA receiving set and satellite navigation receivers, radio direction finding (RDF) equipment, the Ship's Inertial Navigation System (SINS), the Tactical Air Navigation (TACAN) system and its antenna, and navigation computers.

TROUBLESHOOTING OF RADAR/SONAR SYSTEMS refers to the process of locating malfunctions in radar and sonar systems by methodical procedures. Includes performing tests and isolating equipment faults and failures to the subsystem level, to the major component level, and to the failed circuit part in radar indicators; radar signal distribution systems; radar antenna motion systems; air and surface search radar systems; Ground Controlled Approach (GCA) and Carrier Controlled Approach (CCA) radar systems; weather radar; Identification, Friend or Foe (IFF) radar; and fathometers.

TROUBLESHOOTING OF WEAPON AND MISSILE SYSTEMS refers to the process of locating malfunctions in weapon and missile systems by methodical procedures. Includes making measurements, performing tests and test procedures, and isolating component faults and malfunctions.

TROUBLESHOOTING OF WEATHER SYSTEMS refers to the process of locating malfunctions in weather systems by methodical procedures. Includes performing tests and isolating equipment faults and failures to the major component level and to the failed circuit part in anemometers, cloud height sets, radiosonde receptors, weather vision systems, and weather satellite receiver-recorder systems.

WATCH STANDING refers to performing the duty of standing a watch--the duty period at sea, normally four hours long. A watch is any of the periods of time into which the day aboard ship is divided and during which a part of the crew is assigned to duty. Includes manning CONFLAG stations.

Standing a *security* watch would be considered SECURITY. The duty of standing *any other watch* would be considered WATCH STANDING.

WEAPON AND MISSILE SYSTEMS refer to military weapons and weapon systems, along with ammunition, pyrotechnics, and the equipment to keep these systems in good repair. Involves the construction/fabrication, installation, maintenance, operation, troubleshooting, and repair of weapon and missile systems, including the technical knowledge required to perform these functions. When the specific function is mentioned, use the more specific second-level label to describe it.

WEATHER SYSTEMS refer to equipment and systems for assessing the meteorological condition of the atmosphere (temperature, moisture, wind velocity, and pressure), such as barometers, anemometers, cloud height sets, radiosonde receptors, weather vision systems, and weather satellite receiver-recorder systems. Involves the maintenance, troubleshooting, and repair of these systems. When the specific function is mentioned, use the more specific second-level label to describe it.

WORK DETAIL OR PARTY refers to a group of individuals assigned to a specific job. Includes participating in field days, sweepdowns, and working parties; chipping and painting working/living spaces; and performing grounds maintenance.

APPENDIX E

ALPHABETICAL DICTIONARY OF THE ACTION VERBS USED IN THE CONTENT ANALYSIS

FORMAT: The action verbs shown in regular font are exactly as they appear in Appendix G to Section I of the Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards. Any additions that were made as a result of this content analysis are shown in italic font.

ACKNOWLEDGE - Report receipt of (a letter, check, supplies, etc.); e.g., acknowledge receipt of aviation material.

ACTIVATE - Make active; e.g., activate storage batteries.

ADJUST - Fit to meet regulations or requirements.

ADMINISTER - Manage or direct execution, conduct, or application of.

ADVISE/*COUNSEL* - Recommend course of action; provide information.

ALIGN - Adjust, form, or bring to a line.

ALTER - Make different, e.g., alter trousers, alter compass heading.

ANALYZE - Study parts, elements, or factors of a situation or problem in detail to determine course of action, solution, or outcome; e.g., analyze malfunction of servo and computing circuits.

ANNEAL - Subject to high heat, with subsequent cooling, for the purpose of softening thoroughly and rendering less brittle; e.g., anneal gravers, springs, and screwdriver bits.

APPLY - Put to use; e.g., apply connections to degaussing coils.

APPROVE - Give official sanction to; e.g., approve proposed plans and procedures.

ARRANGE - Put in order; make preparations for; e.g., arrange a melody for a concert band, arrange courtroom for trial.

ASSEMBLE - Put together into a unit from parts or subassemblies; e.g., assemble usage and inventory data.

ASSIGN - Specify, select, or designate; e.g., assign responsibilities to CIC personnel.

ASSIST - Aid, help, support; e.g., assist dental officer while treating patients.

ATTACH - Connect; fasten.

ATTEND - Be present at.

AUDIT - Examine with intent to verify.

AUTHENTICATE - Prove authentic, confirm, verify as to genuineness; e.g., authenticate on a fleet CW circuit.

BLEED - Drain or empty of liquid, gas, or other contents; e.g., bleed a steam cylinder.

BLEND - AIRCRAFT MAINTENANCE FIELD: Apply jeweler's rouge or an emery cloth, for example, to the surface of blades inside aircraft engines to remove foreign particles implanted on the blades; e.g., blend power turbine blades or blend compressor rotor blades.

BREAK OUT - Take down from or out of a customary place of storage for an operational or maintenance purpose; e.g., break out a sound-powered phone headset.

BRIEF - Present the pertinent facts; e.g., brief pilots before a mission.

BUILD UP - Replace worn material in order to return (an article) to original dimension or thickness.

CALIBRATE - Ascertain the caliber of, determine, rectify, or mark the gradations of; adjust in accordance with a previously defined standard; e.g., calibrate passive and active sonar equipment.

CERTIFY - Confirm formally in writing as meeting a standard.

CHANGE - Replace with another; e.g., change typewriter ribbons.

CHARGE - Lay or put a load on or in; e.g., charge a torpedo air flask.

CHECK - Inspect for satisfactory condition, accuracy, safety, or performance; e.g., check overhaul schedules for conformity with maintenance program.

CLEAN - Rid of dirt, impurities, or extraneous matter.

COLLECT - Gather together, assemble, accumulate, compile; e.g., collect data.

COMMUNICATE - Give, or give and receive, information, signals, or messages in any way, as by speech, gestures, writing, etc.

COMPARE - Examine for likenesses and/or differences; e.g., compare performance with established standards.

COMPILE - Collect into proper or designated form; e.g., compile data into a report.

COMPLETE - Provide with lacking parts or information; e.g., complete casualty analysis inspection sheets.

COMPLY - Conform to guidelines.

COMPUTE - Determine by mathematical processes; e.g., compute leave balances and leave credits.

CONDUCT - Lead; direct; e.g., conduct a musical overture, conduct military drills.

CONSTRUCT - Put together systematically; e.g., construct bench and floor molds.

CONTROL - Keep within limits; e.g., control site deployment of materials and equipment.

CONVERT - Change from one use, function, or purpose to another.

COORDINATE - Bring into common action with others; e.g., coordinate repair activities between ship and shipyard.

CUT - Make or fashion by cutting; e.g., cut with a gas cutting torch or shears.

DECONTAMINATE - Rid of contamination.

DEFUEL - Remove fuel.

DELIVER - Take to the intended recipient.

DESIGN - Plan or sketch a pattern or outline for; e.g., design cards and report forms.

DESTROY - Ruin completely, or spoil so that restoration is impossible.

DETECT - Discover the presence or existence of something previously hidden or unclear; e.g., detect chemical warfare agents.

DETERMINE - Obtain definite and first hand knowledge of; e.g., determine one's position at sea by plotting a cross bearing on two or more references.

DEVELOP - Unfold more completely, evolve the possibilities of (something latent), advance, further, promote the growth of; unfold gradually, form or expand by a process of growth; make more available or usable.

DIAGNOSE - Recognize, analyze and identify (usually a disease, but in military parlance any condition, state, or situation) by examination and observation; e.g., diagnose irregular flight characteristics of aircraft.

DIRECT - Regulate the activities or course of; control; guide; give an order or instruction to; e.g., direct men in deck watch section.

DISASSEMBLE - Break down, take apart; e.g., disassemble an electrical generator.

DISSEMINATE - Diffuse, distribute, spread by dispersion, circulate; e.g., disseminate intelligence data.

DISTRIBUTE - Divide, deal out, portion; e.g., distribute incoming mail to ship divisions.

DRAFT - Make a preliminary sketch or composition; e.g., draft a naval message.

DRAIN - Draw off liquid gradually or completely.

DRAW - Create a likeness or picture in outlines; sketch.

EDIT - Revise and make ready for publication; assemble (as a motion picture) by cutting and rearranging.

ENERGIZE - Give energy to, activate; switch on; e.g., energize an electrical circuit.

ENSURE - Make certain and inevitable; make sure of; e.g., ensure maximum care of patients.

ESTIMATE - Form a judgment about; gauge; determine or calculate approximately; e.g., estimate the need for supplies and equipment.

EVALUATE - Determine value or worth of, appraise; e.g., evaluate inspection forms.

EXAMINE - Scrutinize to determine nature, condition, or quality of.

FABRICATE - Construct from design or by assembling standard parts or sections; e.g., fabricate templates.

FILE - Lay away documents, papers, etc., in a methodical manner; set in order.

FIRE - Ignite or discharge a firearm or military weapon.

FIRE FIGHT - Fight and extinguish fires.

FLUSH - Pour liquid over or through; wash out with a rush of liquid.

FOLLOW UP - Carry to completion; follow through.

FORM - Contruct; frame.

FUEL - Provide with fuel.

GROUND - Connect with the ground (or with some conduction body in place of the earth) so as to make the earth part of a circuit.

HANDLE - Manage, control, direct, deal with, perform a function with regard to, treat, manipulate; e.g., handle manila or wire rope.

HONE - Sharpen, give an edge to, or enlarge holes to precise dimensions and controlled finishes.

IDENTIFY - Establish the identity of; distinguish; discriminate; in nautical parlance, recognize or name; e.g., identify flags and ensigns of major maritime powers.

INITIATE - Bring into practice or use; e.g., initiate routine correspondence.

INSERT - Put or thrust in; e.g., insert a bathythermograph card.

INSPECT - Look at carefully; examine critically; examine or review officially; e.g., inspect commutator segments and brushes for alignment.

INSTALL - Set up or fix for use or service; establish in a place; e.g., install a boat compass.

INSTRUCT - Impart knowledge systematically; inform; furnish with directions; direct or command; train or indoctrinate; e.g., instruct personnel in identification of ships and aircraft.

INTERPRET - Determine the meaning of.

INVENTORY - Prepare an itemized account of goods or stock, usually at regular intervals; e.g., inventory allowed materials.

INVESTIGATE - Observe or study by close examination and systematic inquiry; e.g., investigate aircraft accidents.

ISOLATE - Select from among others.

ISSUE - Give out officially, as orders and directives, supplies, and equipment.

JACK - Hoist or raise with a jack.

JOIN - Connect; link together.

LOAD - Lay a load or burden on or in; place a load or charge in (a firearm, rocket launcher, etc.); e.g., load guns.

LOCATE - Designate the site or place of, define the limits of.

LOG - Enter into a ship's log, make a record of speed, direction, and distance traversed; enter into any naval record; e.g., log routine correspondence.

LUBRICATE - Make smooth or slippery.

MAINTAIN - Hold or keep in a state or condition, especially in a state of efficiency, newness, validity, or cleanliness; e.g., maintain a surface plot.

MANUFACTURE - Make by hand, machinery, or other agency; work into suitable form for use; fabricate; e.g., manufacture reinforced concrete block.

MARK - Affix a significant identification to; indicate by marks or symbols.

MEASURE - Ascertain the extent, degree, quantity, dimensions or capacity of, by a standard; e.g., measure radar ringtime.

MONITOR - Observe, listen to, check on (as equipment, person, or function) for compliance with instructions or regulations, or for effectiveness; e.g., monitor organizational level maintenance.

OBTAIN - Procure, get possession of; e.g., obtain data for inclusion in a rough deck log.

OPERATE - Cause to function.

ORGANIZE - Arrange; systematize persons or things into proper places, especially in relation to each other.

OVERHAUL - Examine thoroughly, checking for needed repairs and making repairs and adjustments needed to restore working order; e.g., overhaul generating and control equipment.

PACKAGE/*PACK* - *Fold, roll, or combine into a bundle; wrap tightly or surround with suitable material for protection or to prevent leakage;* wrap or box as for selling, carrying, disposing, or storage; e.g., package items for shipping.

PAINT - *Coat, cover, or decorate something with paint.*

PARTICIPATE - *Take part in.*

PATCH - Mend, repair, strengthen, etc., with a patch or overlay; e.g., patch lacerations, abrasions, and punctures of life rafts.

PERFORM - Carry out or execute some action.

PHOTOGRAPH - Take a picture of.

PLACE - Position; set in a particular place; e.g., place concrete.

PLAN - Think out beforehand; e.g., plan day-to-day job assignments.

PLOT - Mark the position of something on a map or plan; e.g., plot ranges, bearings, and fixes on nautical charts.

POSITION - Put in proper place.

PREPARE - Make ready; put into a state for use or application; e.g., prepare a request for survey.

PRESERVE - Keep from harm, damage, danger, etc.

PROCESS - Subject to a special treatment; e.g., process photographic film.

PROOFREAD - Read and mark corrections in (a proof).

PURGE - Cleanse or rid of impurities, foreign matter, or undesirable elements; e.g., purge air from air conditioning systems.

PUSH - Exert force against an object to drive it, impel it, or move it away or ahead.

READ - Interpret the meaning of.

REASSEMBLE - Refit together the parts of.

RECOMMEND - Offer or suggest course of action.

RECORD - Write, enter, or register for purpose of evidence or reproduction; e.g., record data in a chronometer record book; SECURITY FIELD: Transform sound by electrical or mechanical means, and register it in some permanent form.

REEVE - Fasten by passing through a hole and/or around something; e.g., reeve a single whip, runner, luff tackle, or twofold purchase.

REFURBISH - Make clean, bright, or fresh again; renovate.

REGULATE - Control or govern according to a rule, principles, or system; adjust for accurate operation, as gauges or scales; e.g., regulate water level in a steaming boiler.

REMOVE - Change the location of by taking off, out of, or away from, lifting, pushing aside; e.g., remove a bathythermograph card.

REPAIR - Restore to working condition, as equipment, at field or higher echelon maintenance; e.g., repair radio headsets and microphones.

REPLACE - Supply an equivalent for; e.g., replace hydrophones and transducers.

REPLENISH - Fill up again; replace.

REPORT - Give an account of orally or in writing.

REPRESENT - Serve as the official and authorized delegate or agent for; act as the spokesman for.

REQUISITION - Make a formal request, application, or written order, as for equipment, tools, paper, food, supplies; e.g., requisition supplies.

RESCUE - Free from confinement, violence, or danger; e.g., rescue a person in contact with an energized electrical circuit.

RETRIEVE - Get back; recover.

REVIEW - Examine critically or deliberately; e.g., review transactions involving expenditure of funds.

RIG - Furnish or provide with equipment; e.g., rig with wire rope.

ROUTE - Fix the order of procedure in a series of operations; e.g., route classified matter.

SCHEDULE - Designate fixed times for accomplishment of, as training programs, mail deliveries, courier service, etc.

SCORE - Determine the merit of; grade.

SCREEN - Examine in order to separate into different groups.

SEARCH - Look for, hunt through, examine, explore, inquire, scrutinize.

SECURE - Make safe, firm, fast, or tight.

SEND - Dispatch by some means of communication.

SERVE - Perform the duties of a specific assignment; e.g., serve as a crew member.

SERVICE - Provide minor maintenance such as supply aircraft or motor vehicles with fuel and oil.

SHARPEN - Make sharp.

SIGN - Affix one's signature to.

SOLDER - Join with solder; e.g., solder pipe fittings.

SORT - Arrange according to characteristics.

SPLICE - Join or unite (ropes and wires) by weaving together the end strands; e.g., splice halyards.

STAND - Perform the duty of; e.g., stand the fire watch.

STAND BY - Wait; be available.

STERILIZE - Free from living germs; e.g., sterilize dental instruments.

STORE - Deposit in a place (as a warehouse) for preservation and/or security.

STOW - Place or arrange in a compact mass; e.g., stow charts and other navigational aids.

STRIP - Remove extraneous or superficial matter from; mount a photographic negative or positive in position on copy to be used for making a printing plate.

SUBMIT - Present or refer to others for decision or consideration; e.g., submit reports, proposals, estimates, etc.

TERMINATE - Bring to an end; conclude; finish.

TEST - Examine critically or try out material.

TOW - Draw or pull along behind by a chain, line, or rope.

TRACK - Follow the course of; trace by means of such evidence as radar blips and sonar echoes.

TRAIN - Form or impart proficiency by teaching, drilling, instructing, discipline, etc.

TRANSCRIBE - Translate data or information from one recording form to another.

TRANSFER - Convey from one place, person, or thing to another.

TREAT - Act upon with some agent to improve or alter; e.g., treat a metal with acid.

TROUBLESHOOT - Locate by methodical procedures malfunctions in equipment; e.g., troubleshoot electrical and mechanical control systems.

TUNE - Adjust or adapt to a condition, state, etc.

TURN IN - Hand in; return.

TYPE - Produce visual information by means of a typewriter.

UNLOAD - Take the cargo from.

UNPACKAGE/*UNPACK* - Remove covering from; *remove the contents of; remove from a container or from packaging.*

UPDATE - Bring up to date.

USE - Employ; carry out purpose or action by means of; expend or consume by putting to use; e.g., use electrical and electronic schematics.

VENT - Permit the passage or escape of liquids, gases, fumes, steam, or the like.

VERIFY - Confirm condition, correctness, status, or level.

WELD - Unit or fuse pieces of metal by hammering, compression, or heat.

WIRE - Use wire on; e.g., wire shut a valve.

WRITE - Compose; e.g., write captions for pictures.

ZERO - Determine or adjust the zero of; e.g., zero synchros.

APPENDIX F

DESCRIPTIVE RESULTS OF THE CONTENT ANALYSIS

FORMAT: In this appendix the results are organized in three levels. At the first level, the results are presented alphabetically by Navy enlisted rating. Within each rating the category labels that were used in the content analysis for that rating are arranged in alphabetical order. For each category label that was used, all of the action verbs selected are lsited in alphabetic order with a cross-reference to the task statements that were assigned a particular category label and action verb. The frequencies of assignment are included also.

AVIATION BOATSWAIN'S MATE - AB

AIRCRAFT FUELING AND LUBRICATION *(Category Label)* Freq. Sum = 65

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	95	1
Change	85, 220, 298, 311, 313, 314	6
Charge	316	1
Check	308	1
Clean	82, 285, 309, 319	4
Defuel	121	1
Determine	293	1
Fabricate	317	1
Fuel	43, 118, 120, 121, 422	5
Ground	119	1
Inspect	304	1
Install	296	1
Inventory	295	1
Join	419	1
Lubricate	116	1
Maintain	318, 417, 423, 424	4
Measure	306	1
Operate	41, 297, 305	3
Patch	115	1
Purge	45	1
Remove	216, 290, 291, 299, 301, 303, 310	7
Repair	317, 418	2
Replace	86, 113, 114, 216, 218, 288, 289, 290, 291, 299, 300, 301, 302, 303, 310	15
Strip	315	1
Test	416, 420	2
Vent	117	1

AIRCRAFT HANDLING *(Category Label)* Freq. Sum = 33

Action Verbs	*Task Statement Numbers*	*Freq.*
Apply	248	1
Attach	256, 348, 381	3
Check	329	1
Direct	350, 364, 369, 393	4
Disassemble	26	1
Energize	253	1
Inspect	26, 368	2
Install	356, 382	2
Operate	344, 345, 367, 415	4
Push	262	1
Remove	256, 348, 381, 382	4
Repair	330, 353, 354	3
Rig	215, 430	2
Secure	261	1
Stow	140	1
Tow	263, 378	2

AIRCRAFT LAUNCH AND RECOVERY *(Category Label)* Freq. Sum = 147

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	44, 73, 134, 201, 428, 429	6
Alter	425	1
Apply	336	1
Assemble	37, 38, 39, 40, 61, 385	6
Break Out	25	1
Build Up	104	1
Calibrate	196	1
Change	58, 80, 96, 135, 189, 190, 194, 203, 390, 391	10
Check	21, 32	2
Clean	59, 63, 74, 123, 392	5
Compute	395	1
Construct	100, 101	2
Determine	384, 404	2
Direct	365	1
Disassemble	37, 38, 39, 40, 61, 385	6
Drain	392	1
Ensure	48, 56	2
Examine	27, 49, 63, 73, 183, 185, 195	7
Fabricate	211	1
Fire	383	1
Inspect	24, 366, 386	3
Install	35, 62, 102, 103, 136, 239, 387, 433	8
Join	29, 31	2
Lubricate	54, 139	2
Measure	47, 395	2
Operate	33, 34, 55, 427	4
Paint	187	1
Position	69, 204, 206, 207	4
Prepare	30	1
Preserve	87	1
Reassemble	131, 388	2
Reeve	182	1
Regulate	125, 191, 202	3
Remove	35, 36, 64, 65, 66, 67, 70, 75, 122, 126, 130, 181, 193, 199, 200, 205, 238, 334, 335, 389	20
Repair	71	1
Replace	22, 36, 46, 50, 51, 64, 65, 66, 67, 70, 75, 76, 93, 122, 126, 128, 129, 130, 133, 181, 184, 186, 188, 193, 199, 200, 389, 394	28
Rig	57, 105	2
Secure	342	1
Service	78	1
Splice	405	1
Transfer	127	1

AVIATION SUPPORT *(Category Label)* — Freq. Sum = 28

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	346, 362	2
Alter	411	1
Build Up	358	1
Change	363	1
Check	351	1
Clean	337, 377	2
Compute	414	1
Construct	402	1
Direct	332, 333	2
Issue	374	1
Load	357	1
Locate	401	1
Operate	347, 409	2
Paint	379	1
Place	375	1
Position	413	1
Process	408	1
Rig	370	1
Search	343	1
Send	144	1
Service	410, 412	2
Unload	357, 371	2

CLERICAL FUNCTIONS *(Category Label)* — Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Construct	112	1
Follow Up	168	1
Maintain	107, 152, 156, 166	4
Prepare	111	1
Route	151	1
Schedule	246	1
Type	149	1

COMMUNICATION *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Draft	108, 155	2

CONDUCT OF TRAINING *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Administer	179	1
Conduct	406	1
Score	1	1

CONSTRUCTION/FABRICATION OF AIRCRAFT SYSTEMS *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Cut	83	1
Design	258	1

CONTROLLING *(Category Label)* — Freq. Sum = 14

Action Verbs	*Task Statement Numbers*	*Freq.*
Conduct	259	1
Inspect	68, 90, 226, 359, 361, 403	6
Participate	249	1
Review	109, 164	2
Screen	154, 167, 170, 242	4

DAMAGE CONTROL *(Category Label)* — Freq. Sum = 38

Action Verbs	*Task Statement Numbers*	*Freq.*
Activate	268	1
Change	325	1
Charge	233	1
Check	321	1
Clean	312, 320, 432	3
Decontaminate	312, 320, 432	3
Fire Fight	264, 265, 271	3
Inspect	269, 274, 372	3
Maintain	148, 275	2
Obtain	272	1
Operate	279, 323, 324, 328, 355	5
Reeve	352	1
Replace	270, 322	2
Replenish	273, 280, 434	3
Rescue	267	1
Rig	146, 266	2
Stand By	278, 327	2
Test	307, 326	2
Turn In	272	1

DRILLS, INSPECTIONS, AND COMMAND MILITARY FUNCTIONS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Participate	23	1

GRAPHICS SUPPORT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Prepare	177	1

HYDRAULIC/PNEUMATIC MAINTENANCE *(Category Label)* — Freq. Sum = 9

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	217	1
Bleed	214	1
Charge	197	1
Check	431	1
Clean	91	1
Drain	232	1
Remove	99	1
Replace	99, 219	2

INFORMATION RELEASE/PROMULGATION *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Maintain	150, 163	2
Requisition	14	1
Update	106	1

INFORMATION RETRIEVAL AND DATA ANALYSIS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Analyze	165	1

INSTALLATION OF AIRCRAFT SYSTEMS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Install	400	1

AVIATION BOATSWAIN'S MATE - AB (Cont.)

KNOWLEDGE OF AIRCRAFT SYSTEMS *(Category Label)* Freq. Sum = 13

Action Verbs	*Task Statement Numbers*	*Freq.*
Check	396	1
Convert	42	1
Interpret	257, 260	2
Read	28, 52, 124, 198, 257, 260, 284, 376, 426	9

LEADERSHIP AND SUPERVISION *(Category Label)* Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Brief	360	1
Requisition	162	1
Update	153	1

LOGISTICS *(Category Label)* Freq. Sum = 14

Action Verbs	*Task Statement Numbers*	*Freq.*
Break Out	16	1
Draft	169	1
Inventory	175	1
Issue	12	1
Mark	255	1
Obtain	11	1
Report	15	1
Requisition	13, 17	2
Review	174	1
Screen	18, 19	2
Stow	16	1
Turn In	11	1

MAINTENANCE OF AIRCRAFT SYSTEMS *(Category Label)* Freq. Sum = 7

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	97, 398	2
Align	398	1
Clean	349, 373	2
Rig	407	1
Service	380	1

MAINTENANCE OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Check	147	1

MAINTENANCE OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	236	1

MECHANICAL MAINTENANCE *(Category Label)* — Freq. Sum = 27

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	221	1
Align	234	1
Calibrate	231	1
Change	339	1
Clean	142, 212, 237, 277	4
Hone	209	1
Lubricate	98	1
Regulate	231	1
Remove	224, 225, 228	3
Repair	141	1
Replace	84, 208, 210, 212, 222, 224, 225, 252	8
Secure	235, 250	2
Weld	227, 229	2

MEETINGS, SEMINARS, AND CONFERENCES *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Participate	160	1

OPERATION OF OFFICE EQUIPMENT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Operate	7	1

ORGANIZATION *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Coordinate	172, 173, 294	3

AVIATION BOATSWAIN'S MATE - AB (Cont.)

PERSONNEL SUPPORT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Counsel	110	1

PLANNING *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	159	1
Construct	145	1
Evaluate	243	1

REPAIR OF AIRCRAFT SYSTEMS *(Category Label)* — Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Overhaul	286	1
Remove	88, 251	2
Repair	286, 397	2
Replace	88, 89, 251	3

REPAIR OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Replace	421	1

SAFETY *(Category Label)* — Freq. Sum = 12

Action Verbs	*Task Statement Numbers*	*Freq.*
Comply	241	1
Distribute	20	1
Ensure	53	1
Inspect	240, 292, 331	3
Maintain	338	1
Paint	60	1
Repair	340	1
Replace	340	1
Serve	247	1
Wire	254	1

STAFFING *(Category Label)* Freq. Sum = 6

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	157, 158	2
Recommend	244	1
Review	171, 244	2
Write	161	1

TRAINING ADMINISTRATION *(Category Label)* Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Maintain	3	1
Prepare	4	1
Proofread	178	1
Screen	178	1

TRAINING DEVELOPMENT *(Category Label)* Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Manufacture	176	1
Prepare	5, 6	2
Update	2	1

TROUBLESHOOTING OF AIRCRAFT SYSTEMS *(Category Label)* Freq. Sum = 20

Action Verbs	*Task Statement Numbers*	*Freq.*
Check	79	1
Compute	72	1
Measure	81, 92, 132, 137, 138, 192, 213, 223	8
Test	77, 94, 180, 230, 281, 282, 283, 341, 399	9
Troubleshoot	287	1

WATCH STANDING *(Category Label)* Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Stand	143, 276	2

WORK DETAIL OR PARTY *(Category Label)* Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Maintain	10	1
Paint	9	1
Participate	8, 245	2

AVIATION MACHINIST'S MATE - AD

AIRCRAFT FUELING AND LUBRICATION *(Category Label)* — Freq. Sum = 9

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	384	1
Check	9, 157	2
Defuel	74	1
Flush	395	1
Fuel	74, 88	2
Lubricate	326	1
Purge	323	1

AIRCRAFT HANDLING *(Category Label)* — Freq. Sum = 18

Action Verbs	*Task Statement Numbers*	*Freq.*
Apply	69	1
Attach	65, 66, 80	3
Direct	64	1
Install	67	1
Jack	202	1
Position	86, 362	2
Push	70	1
Remove	65, 66, 67, 80	4
Rig	318	1
Secure	68	1
Stow	8	1
Tow	71	1

AIRCRAFT LAUNCH AND RECOVERY *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Apply	340	1
Install	85	1

AVIATION SUPPORT *(Category Label)* — Freq. Sum = 13

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	23	1
Brief	78, 176	2
Check	45	1
Issue	192	1
Load	83, 208	2
Maintain	370	1
Prepare	123	1
Rig	336	1
Stow	82	1
Unload	83	1
Update	154	1

CLERICAL FUNCTIONS *(Category Label)* Freq. Sum = 16

Action Verbs	*Task Statement Numbers*	*Freq.*
Arrange	151	1
File	111	1
Log	110	1
Maintain	130, 131	2
Prepare	44, 104, 105, 122, 124, 125, 379, 383, 401	9
Requisition	121	1
Route	109	1

COMMUNICATION *(Category Label)* Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Conduct	209	1
Draft	140	1

CONDUCT OF TRAINING *(Category Label)* Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Administer	55	1
Conduct	53	1
Score	51	1

CONSTRUCTION/FABRICATION OF AIRCRAFT SYSTEMS *(Category Label)* Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Fabricate	250	1

CONTROLLING *(Category Label)* Freq. Sum = 36

Action Verbs	*Task Statement Numbers*	*Freq.*
Approve	84, 133, 376	3
Audit	116	1
Inspect	30, 31, 32, 34, 35, 36, 39, 40, 41, 42, 47, 49, 146, 195, 397, 399, 400	17
Investigate	168, 373	2
Monitor	175	1
Recommend	134, 152	2
Review	108, 115, 377	3
Screen	106, 107, 143, 144, 372, 374, 375	7

CORROSION CONTROL AND MATERIAL PRESERVATION *(Category Label)* — Freq. Sum = 15

Action Verbs	*Task Statement Numbers*	*Freq.*
Clean	343	1
Inspect	43	1
Mark	337, 344	2
Paint	348, 366	2
Prepare	345, 346	2
Preserve	206, 347	2
Remove	341, 342	2
Repair	339	1
Strip	352	1
Treat	350	1

DAMAGE CONTROL *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Examine	193	1
Maintain	367	1
Stand By	92	1

HYDRAULIC/PNEUMATIC MAINTENANCE *(Category Label)* — Freq. Sum = 11

Action Verbs	*Task Statement Numbers*	*Freq.*
Remove	237, 252, 261, 263	4
Replace	237, 252, 261, 263	4
Service	212, 215	2
Troubleshoot	228	1

INFORMATION RELEASE/PROMULGATION *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Construct	317	1
Maintain	155	1
Prepare	100	1
Requisition	112	1
Update	145	1

INFORMATION RETRIEVAL AND DATA ANALYSIS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Analyze	127	1

AVIATION MACHINIST'S MATE - AD (CONT.)

INSTALLATION OF AIRCRAFT SYSTEMS *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Install	280	1
Join	266	1

INSTALLATION OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Install	141	1

KNOWLEDGE OF AIRCRAFT SYSTEMS *(Category Label)* — Freq. Sum = 9

Action Verbs	*Task Statement Numbers*	*Freq.*
Construct	194	1
Convert	283	1
Plot	285	1
Read	96, 287	2
Record	287	1
Review	170	1
Use	381, 382	2

LEADERSHIP AND SUPERVISION *(Category Label)* — Freq. Sum = 12

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	25, 26	2
Collect	179	1
Evaluate	117, 118	2
Prepare	102, 120	2
Recommend	148, 149, 167	3
Update	120, 129	2

AVIATION MACHINIST'S MATE - AD (CONT.)

LOGISTICS *(Category Label)* — Freq. Sum = 20

Action Verbs	*Task Statement Numbers*	*Freq.*
Deliver	187	1
Inventory	242, 245	2
Issue	185	1
Mark	198, 371	2
Obtain	186, 187	2
Package/Pack	113, 160, 183, 189	4
Prepare	142	1
Requisition	138, 241	2
Screen	169	1
Stow	188	1
Turn In	186	1
Unpackage/Unpack	113, 182	2

MAINTENANCE OF AIRCRAFT SYSTEMS *(Category Label)* — Freq. Sum = 55

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	95, 203, 205, 284, 288, 304, 333, 335, 389	9
Align	181, 190, 398	3
Alter	251	1
Blend	191, 240	2
Calibrate	190, 273, 385, 398	4
Check	91, 216, 387	3
Clean	14, 87, 94, 114, 126, 363	6
Flush	126, 391	2
Maintain	270	1
Package/Pack	90	1
Position	322	1
Regulate	385	1
Rig	207, 256, 277, 278	4
Secure	320	1
Service	16, 17, 79, 213, 214, 217, 218, 219, 221, 222, 223, 224, 225, 380	14
Sharpen	161	1
Track	332	1

MAINTENANCE OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Apply	7	1
Examine	236	1

AVIATION MACHINIST'S MATE - AD (CONT.)

MECHANICAL MAINTENANCE *(Category Label)* — Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Clean	368	1
Remove	56, 313	2
Replace	56, 313	2
Weld	132, 136, 139	3

MEETINGS, SEMINARS, AND CONFERENCES *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Participate	150	1

OPERATION OF AIRCRAFT SYSTEMS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Monitor	11	1

ORGANIZATION *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Coordinate	162, 402	2

PERSONNEL SUPPORT *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Counsel	164, 165	2

PLANNING *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	27	1
Schedule	135	1

AVIATION MACHINIST'S MATE - AD (CONT.)

REPAIR OF AIRCRAFT SYSTEMS *(Category Label)* Freq. Sum = 218

Action Verbs	*Task Statement Numbers*	*Freq.*
Assist	204	1
Build Up	369	1
Overhaul	18, 20, 21, 22, 298, 301, 353, 354, 355, 356, 357, 358, 359, 361, 393	15
Remove	2, 3, 4, 5, 10, 12, 13, 15, 19, 29, 33, 37, 38, 48, 62, 73, 81, 89, 98, 158, 163, 166, 171, 173, 174, 180, 196, 197, 201, 210, 211, 220, 227, 232, 233, 234, 238, 239, 243, 244, 246, 247, 248, 249, 253, 254, 257, 259, 260, 262, 264, 265, 267, 268, 269, 271, 272, 274, 275, 276, 281, 289, 290, 291, 292, 293, 294, 295, 297, 299, 300, 302, 303, 312, 314, 315, 319, 321, 324, 325, 327, 328, 329, 330, 331, 334, 338, 349, 351, 360, 386, 388, 390, 392, 394, 396, 403, 404	98
Repair	364	1
Replace	2, 3, 4, 5, 10, 12, 13, 15, 19, 28, 29, 33, 37, 38, 48, 62, 73, 81, 89, 93, 98, 147, 158, 163, 166, 171, 173, 174, 180, 196, 197, 201, 210, 211, 220, 227, 232, 233, 234, 238, 239, 243, 244, 246, 247, 248, 249, 253, 254, 257, 259, 260, 262, 264, 265, 267, 268, 269, 271, 272, 274, 275, 276, 281, 289, 290, 291, 292, 293, 294, 295, 297, 299, 300, 302, 303, 312, 314, 315, 319, 321, 324, 325, 327, 328, 329, 330, 331, 334, 338, 349, 351, 360, 365, 386, 388, 390, 392, 394, 396, 403, 404	102

REPAIR OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Remove	54, 235	2
Replace	54, 235	2

REPORTING *(Category Label)* Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Report	99, 137	2

AVIATION MACHINIST'S MATE - AD (CONT.)

REPRESENTATION *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Assist	199	1
Maintain	177	1
Serve	178	1

SAFETY *(Category Label)* — Freq. Sum = 9

Action Verbs	*Task Statement Numbers*	*Freq.*
Certify	153	1
Inspect	156	1
Investigate	60, 97, 172, 296	4
Serve	72	1
Test	46	1
Wire	1	1

SECURITY *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Change	159	1

SOCIAL FUNCTIONS SUPPORT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Arrange	119	1

STAFFING *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	24	1
Certify	200	1
Review	128	1
Write	103	1

TRAINING ADMINISTRATION *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Approve	61, 378	2
Maintain	57	1
Requisition	101	1

AVIATION MACHINIST'S MATE - AD (CONT.)

TRAINING DEVELOPMENT *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Construct	63	1
Prepare	50, 58	2
Write	52, 59	2

TROUBLESHOOTING OF AIRCRAFT SYSTEMS *(Category Label)* — Freq. Sum = 20

Action Verbs	*Task Statement Numbers*	*Freq.*
Check	286	1
Prepare	279	1
Test	75, 76, 77, 184, 255, 282, 305, 306, 307, 308, 309, 310, 311, 316	14
Troubleshoot	229, 230, 231, 258	4

TROUBLESHOOTING OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Test	6	1
Troubleshoot	226	1

ELECTRONICS TECHNICIAN - ET

CLERICAL FUNCTIONS *(Category Label)* — Freq. Sum = 37

Action Verbs	*Task Statement Numbers*	*Freq.*
Alter	150	1
Assemble	123	1
Log	51, 137, 579	3
Maintain	38, 40, 42, 52, 61, 65, 66, 73, 125, 126, 128, 151	12
Mark	120	1
Obtain	122	1
Plan	68, 69	2
Prepare	149, 152, 153	3
Recommend	130	1
Record	131, 133	2
Report	141	1
Requisition	132	1
Route	44	1
Schedule	117, 118	2
Type	41, 42	2
Update	121, 124	2
Verify	67	1

COMMUNICATION *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Conduct	578	1
Draft	34, 35, 36, 37	4

CONDUCT OF TRAINING *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Administer	82	1
Conduct	91	1
Score	83	1

CONSTRUCTION/FABRICATION OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Assemble	251	1
Build Up	243	1
Fabricate	243, 249, 252	3

CONTROLLING *(Category Label)* Freq. Sum = 18

Action Verbs	*Task Statement Numbers*	*Freq.*
Advise	27	1
Evaluate	25	1
Inspect	12, 142, 576	3
Prepare	110	1
Report	140	1
Review	1, 49, 145, 154	4
Screen	5, 74, 108, 134	4
Verify	139, 147, 148	3

DAMAGE CONTROL *(Category Label)* Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Decontaminate	592	1
Handle	592	1
Maintain	575, 582	2

DRILLS, INSPECTIONS AND COMMAND MILITARY FUNCTIONS *(Category Label)* Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Attend	71, 573	2
Stand	572	1

ELECTRONIC WARFARE *(Category Label)* Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	334	1
Align	334	1
Clean	333	1
Inspect	335	1
Lubricate	333	1
Remove	332	1
Replace	332	1
Test	335	1
Troubleshoot	336, 337	2

INFORMATION RELEASE/PROMULGATION *(Category Label)* Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Draft	48	1
Maintain	43, 46	2
Update	39	1

INFORMATION RETRIEVAL AND DATA ANALYSIS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Analyze	24	1

INSTALLATION OF BROADCASTING SYSTEMS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Rig	580	1

INSTALLATION OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Install	342	1

INSTALLATION OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Install	172, 255, 256, 355	4
Locate	355	1

INSTALLATION OF RADAR/SONAR SYSTEMS *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Install	430	1
Remove	430	1

KNOWLEDGE OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Analyze	187	1
Compute	240, 241, 242	3
Identify	155	1
Isolate	160, 161	2
Review	159	1

KNOWLEDGE OF RADAR/SONAR SYSTEMS *(Category Label)* Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Record	429	1

LEADERSHIP AND SUPERVISION *(Category Label)* Freq. Sum = 7

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	19	1
Ensure	21	1
Prepare	20	1
Requisition	50	1
Update	53, 54	2
Write	18	1

LOGISTICS *(Category Label)* Freq. Sum = 24

Action Verbs	*Task Statement Numbers*	*Freq.*
Acknowledge	111	1
Compare	143	1
Draft	105	1
Follow Up	112	1
Inventory	101, 102	2
Locate	113	1
Obtain	103, 106, 113	3
Prepare	57	1
Record	58	1
Report	59, 62, 107, 129	4
Requisition	100, 114, 115	3
Review	109	1
Turn In	64, 104	2
Update	127	1
Verify	116	1

MAINTENANCE OF BROADCASTING SYSTEMS *(Category Label)* Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	547, 551, 555, 558, 567	5
Align	547, 551, 555, 558, 567	5

MAINTENANCE OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS *(Category Label)* — Freq. Sum = 47

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	258, 327, 347, 348, 363, 371, 377, 381, 385, 391, 396, 401, 407, 409, 417, 422, 427, 519	18
Align	258, 327, 347, 348, 363, 371, 377, 381, 385, 391, 396, 401, 407, 409, 417, 422, 427, 519	18
Clean	328, 367, 386, 403, 520	5
Lubricate	328, 386, 403, 520	4
Service	367, 522	2

MAINTENANCE OF DATA PROCESSING/COMPUTING EQUIPMENT *(Category Label)* — Freq. Sum = 21

Action Verbs	*Task Statement Numbers*	*Freq.*
Maintain	189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229	21

MAINTENANCE OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 69

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	177, 182, 232, 233, 234, 235, 236, 237, 265, 274, 284, 291, 295, 300, 307, 312, 316, 324, 358	19
Align	265, 274, 284, 291, 295, 300, 307, 312, 316, 358	10
Alter	268	1
Calibrate	181, 185, 281	3
Change	247	1
Check	183	1
Clean	170, 239, 246, 248, 266, 275, 278, 285, 303, 317, 353	11
Conduct	144	1
Examine	245, 270, 278, 353	4
Inspect	305	1
Lubricate	170, 266, 275, 285, 317	5
Maintain	135, 174	2
Prepare	29, 32	2
Schedule	136	1
Service	253, 287, 302, 303, 319, 323	6
Tune	231	1

ELECTRONICS TECHNICIAN - ET (CONT.)

MAINTENANCE OF NAVIGATION SYSTEMS *(Category Label)* Freq. Sum = 16

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	476, 479, 483, 487, 493, 498, 509, 514	8
Align	476, 479, 483, 487, 493, 498, 509, 514	8

MAINTENANCE OF RADAR/SONAR SYSTEMS *(Category Label)* Freq. Sum = 23

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	434, 437, 442, 447, 452, 460, 463, 469, 503	9
Align	434, 437, 442, 477, 452, 460, 463, 469, 503	9
Clean	453, 464, 504	3
Lubricate	453	1
Service	504	1

MAINTENANCE OF WEATHER SYSTEMS *(Category Label)* Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	526, 529, 535	3
Align	526, 529, 535	3
Calibrate	539, 541, 543	3
Service	537	1

MECHANICAL MAINTENANCE *(Category Label)* Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	178, 179	2
Service	593	1

MEETINGS, SEMINARS, AND CONFERENCES *(Category Label)* Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Attend	577	1

ON-THE-JOB TRAINING *(Category Label)* Freq. Sum = 6

Action Verbs	*Task Statement Numbers*	*Freq.*
Instruct	95, 96, 97, 98, 99	5
Train	169	1

ELECTRONICS TECHNICIAN - ET (CONT.)

ORGANIZATION *(Category Label)* — Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Coordinate	7, 13, 14, 15, 16, 22, 26, 175	8

PERSONNEL SUPPORT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Counsel	574	1

PLANNING *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	3	1
Evaluate	11	1
Review	6	1

REPAIR OF BROADCASTING SYSTEMS *(Category Label)* — Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Remove	544, 553, 557, 562, 566	5
Replace	544, 553, 557, 562, 566	5

REPAIR OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS *(Category Label)* — Freq. Sum = 42

Action Verbs	*Task Statement Numbers*	*Freq.*
Remove	257, 326, 338, 341, 343, 349, 362, 365, 372, 376, 379, 383, 390, 395, 398, 404, 411, 414, 421, 424, 518	21
Replace	257, 326, 338, 341, 343, 349, 362, 365, 372, 376, 379, 383, 390, 395, 398, 404, 411, 414, 421, 424, 518	21

REPAIR OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* Freq. Sum = 42

Action Verbs	*Task Statement Numbers*	*Freq.*
Remove	171, 180, 238, 250, 254, 262, 269, 271, 277, 279, 283, 288, 294, 299, 306, 311, 315, 322, 352, 357, 584	21
Replace	171, 180, 238, 250, 254, 262, 269, 271, 277, 279, 283, 288, 294, 299, 306, 311, 315, 322, 352, 357, 584	21

REPAIR OF NAVIGATION SYSTEMS *(Category Label)* Freq. Sum = 16

Action Verbs	*Task Statement Numbers*	*Freq.*
Remove	473, 478, 482, 486, 492, 497, 508, 513	8
Replace	473, 478, 482, 486, 492, 497, 508, 513	8

REPAIR OF RADAR/SONAR SYSTEMS *(Category Label)* Freq. Sum = 18

Action Verbs	*Task Statement Numbers*	*Freq.*
Remove	431, 436, 441, 446, 451, 457, 462, 468, 502	9
Replace	431, 436, 441, 446, 451, 457, 462, 468, 502	9

REPAIR OF WEATHER SYSTEMS *(Category Label)* Freq. Sum = 7

Action Verbs	*Task Statement Numbers*	*Freq.*
Remove	525, 528, 532	3
Repair	538	1
Replace	525, 528, 532	3

REPORTING *(Category Label)* Freq. Sum = 11

Action Verbs	*Task Statement Numbers*	*Freq.*
Report	55, 56, 60, 63, 70, 72, 75, 76, 77, 138, 146	11

REPRESENTATION *(Category Label)* Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Maintain	17	1
Represent	10	1
Serve	23	1

ELECTRONICS TECHNICIAN - ET (CONT.)

SAFETY *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Distribute	47	1
Inspect	30, 31, 594	3
Test	33	1

SECURITY *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Destroy	581	1
Inventory	28	1

STAFFING *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	2, 119	2
Initiate	8	1
Write	4	1

TRAINING ADMINISTRATION *(Category Label)* — Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Approve	88, 94	2
Monitor	9	1
Record	78	1
Report	85	1
Review	81	1
Schedule	80	1
Update	79	1

TRAINING DEVELOPMENT *(Category Label)* — Freq. Sum = 7

Action Verbs	*Task Statement Numbers*	*Freq.*
Construct	93	1
Prepare	87, 92	2
Update	90	1
Write	84, 86, 89	3

TROUBLESHOOTING OF BROADCASTING SYSTEMS *(Category Label)* Freq. Sum = 15

Action Verbs	*Task Statement Numbers*	*Freq.*
Test	548, 552, 556, 559, 561, 568	6
Troubleshoot	545, 546, 549, 550, 554, 560, 563, 564, 565	9

TROUBLESHOOTING OF COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS *(Category Label)* Freq. Sum = 55

Action Verbs	*Task Statement Numbers*	*Freq.*
Test	259, 329, 340, 344, 350, 364, 368, 373, 378, 382, 387, 392, 397, 402, 408, 410, 418, 423, 428, 521	20
Troubleshoot	260, 261, 330, 331, 339, 345, 346, 351, 360, 361, 366, 369, 370, 374, 375, 380, 384, 388, 389, 393, 394, 399, 400, 405, 406, 412, 413, 415, 416, 419, 420, 425, 426, 516, 517	35

TROUBLESHOOTING OF DATA PROCESSING/COMPUTING EQUIPMENT *(Category Label)* Freq. Sum = 21

Action Verbs	*Task Statement Numbers*	*Freq.*
Troubleshoot	188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228	21

TROUBLESHOOTING OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* Freq. Sum = 47

Action Verbs	*Task Statement Numbers*	*Freq.*
Analyze	168	1
Check	156, 157, 158	3
Diagnose	244	1
Locate	166	1
Measure	230	1
Test	165, 173, 176, 184 267, 276, 286, 290, 296, 301, 304, 308, 313, 318, 359, 583, 585	17
Troubleshoot	162, 163, 164, 263, 264, 272, 273, 280, 282, 289, 292, 293, 297, 298, 309, 310, 314, 320, 321, 325, 354, 356	22
Verify	167	1

TROUBLESHOOTING OF NAVIGATION SYSTEMS *(Category Label)* — Freq. Sum = 21

Action Verbs	*Task Statement Numbers*	*Freq.*
Test	477, 480, 484, 488, 494, 499, 510, 515	8
Troubleshoot	474, 475, 481, 485, 489, 490, 491, 495, 496, 506, 507, 511, 512	13

TROUBLESHOOTING OF RADAR/SONAR SYSTEMS *(Category Label)* — Freq. Sum = 27

Action Verbs	*Task Statement Numbers*	*Freq.*
Test	435, 440, 445, 450, 454, 461, 465, 470, 505	9
Troubleshoot	432, 433, 438, 439, 443, 444, 448, 449, 455, 456, 458, 459, 466, 467, 471, 472, 500, 501	18

TROUBLESHOOTING OF WEAPON AND MISSILE SYSTEMS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Isolate	186	1

TROUBLESHOOTING OF WEATHER SYSTEMS *(Category Label)* — Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Test	527, 530, 536	3
Troubleshoot	523, 524, 531, 533, 534, 540, 542	7

WATCH STANDING *(Category Label)* — Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Stand	586, 588, 589, 590, 591, 595, 596, 597	8

WORK DETAIL OR PARTY *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Paint	570, 587	2
Participate	569, 571	2

TORPEDOMAN'S MATE - TM

CLERICAL FUNCTIONS *(Category Label)* — Freq. Sum = 16

Action Verbs	*Task Statement Numbers*	*Freq.*
Log	52, 58, 63, 68	4
Maintain	39, 41, 46, 53, 69	5
Prepare	64, 65, 66	3
Record	56	1
Route	45	1
Type	42, 43	2

COMMUNICATION *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Conduct	331	1
Draft	35, 36, 37, 38	4

CONDUCT OF TRAINING *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Administer	81	1
Conduct	90	1
Score	82	1
Train	101	1

CONSTRUCTION/FABRICATION OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Construct	212	1

CONSTRUCTION/FABRICATION OF WEAPON AND MISSILE SYSTEMS *(Category Label)* — Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Construct	188, 189	2

CONTROLLING *(Category Label)* Freq. Sum = 22

Action Verbs	*Task Statement Numbers*	*Freq.*
Analyze	17	1
Check	303	1
Control	26	1
Evaluate	16	1
Inspect	12, 139, 161, 171, 200, 201, 246, 249, 329	9
Maintain	22	1
Report	59, 62	2
Requisition	14, 60, 61	3
Review	1, 50	2
Screen	5	1

DAMAGE CONTROL *(Category Label)* Freq. Sum = 18

Action Verbs	*Task Statement Numbers*	*Freq.*
Check	321	1
Decontaminate	192, 196	2
Detect	21	1
Fire Fight	179	1
Handle	191	1
Identify	191	1
Inspect	163, 164, 166, 185	4
Maintain	157, 184, 185, 255, 328	5
Operate	177	1
Test	198	1

DRILLS, INSPECTIONS, AND COMMAND MILITARY FUNCTIONS *(Category Label)* Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Attend	326	1
Stand	325	1

HYDRAULIC/PNEUMATIC MAINTENANCE *(Category Label)* Freq. Sum = 12

Action Verbs	*Task Statement Numbers*	*Freq.*
Examine	130	1
Install	149	1
Load	144	1
Maintain	143, 253, 254	3
Overhaul	291, 292	2
Remove	147	1
Service	272, 273	2
Unload	144	1

INFORMATION RELEASE/PROMULGATION *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Draft	49	1
Maintain	44, 47, 76	3
Update	40	1

INFORMATION RETRIEVAL AND DATA ANALYSIS *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Analyze	301	1

INSTALLATION OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Install	134, 243, 311	3

INSTALLATION OF WEAPON AND MISSILE SYSTEMS *(Category Label)* — Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Install	154, 170, 193, 233, 234, 241, 244, 274	8

KNOWLEDGE OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 6

Action Verbs	*Task Statement Numbers*	*Freq.*
Identify	205, 206	2
Read	218, 219	2
Use	220, 221	2

KNOWLEDGE OF WEAPON AND MISSILE SYSTEMS *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Identify	137	1
Photograph	317	1
Read	146, 176	2

LANDING PARTY *(Category Label)* Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Break Out	167	1
Issue	168	1
Participate	169	1
Stow	167	1

LEADERSHIP AND SUPERVISION *(Category Label)* Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	29	1
Ensure	31	1
Prepare	30	1
Recommend	20	1
Requisition	51	1
Update	54, 55	2
Write	28	1

LOGISTICS *(Category Label)* Freq. Sum = 28

Action Verbs	*Task Statement Numbers*	*Freq.*
Acknowledge	24	1
Change	115	1
Conduct	337	1
Determine	19	1
Draft	107	1
Inspect	113	1
Install	162	1
Inventory	103, 104	2
Maintain	74, 117, 152, 337	4
Mark	111	1
Obtain	105, 108	2
Package/Pack	112, 118	2
Remove	162	1
Repair	152	1
Report	114	1
Requisition	102, 109	2
Review	110, 116	2
Turn In	67, 106	2
Unpackage/Unpack	118	1

MAINTENANCE OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	210	1
Align	225	1
Clean	135, 208, 209	3
Examine	135, 209, 210	3
Maintain	259	1
Zero	226	1

MAINTENANCE OF WEAPON AND MISSILE SYSTEMS *(Category Label)* — Freq. Sum = 24

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	227, 228, 251	3
Align	290	1
Alter	128, 129	2
Calibrate	153, 232, 235	3
Certify	202, 203	2
Check	127, 236, 238	3
Clean	250	1
Examine	251	1
Lubricate	250	1
Maintain	123, 186, 260	3
Refurbish	155	1
Service	158	1
Sterilize	248	1
Turn In	148	1

MECHANICAL MAINTENANCE *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Calibrate	151	1
Overhaul	293, 295	2
Turn In	150	1

MEETINGS, SEMINARS, AND CONFERENCES *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Attend	330	1

OPERATION OF RADAR/SONAR SYSTEMS *(Category Label)* Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Operate	120, 121	2

OPERATION OF WEAPON AND MISSILE SYSTEMS *(Category Label)* Freq. Sum = 29

Action Verbs	*Task Statement Numbers*	*Freq.*
Activate	138, 269	2
Assemble	261, 267	2
Break Out	145	1
Convert	230	1
Defuel	305	1
Disassemble	262, 266, 267	3
Fire	125, 256, 257, 258	4
Form	302	1
Fuel	305	1
Handle	125	1
Load	229, 242	2
Operate	141, 142, 159, 160	4
Participate	122	1
Perform	131	1
Prepare	237	1
Record	204	1
Stow	145, 262	2

ORGANIZATION *(Category Label)* Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Coordinate	7, 18, 32	3
Ensure	25	1

PERSONNEL SUPPORT *(Category Label)* Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Counsel	327	1

PLANNING *(Category Label)* Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	3	1
Evaluate	11	1
Prepare	73	1
Review	6	1
Update	73	1

REPAIR OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* Freq. Sum = 21

Action Verbs	*Task Statement Numbers*	*Freq.*
Overhaul	294, 296	2
Remove	214, 215, 223, 224, 312, 313, 314, 315, 316	9
Repair	213	1
Replace	214, 215, 223, 224, 312, 313, 314, 315, 316	9

REPAIR OF WEAPON AND MISSILE SYSTEMS *(Category Label)* Freq. Sum = 49

Action Verbs	*Task Statement Numbers*	*Freq.*
Anneal	187	1
Overhaul	276, 277, 278, 288, 289, 297, 298, 299, 304	9
Remove	136, 172, 175, 178, 182, 190, 194, 195, 199, 245, 247, 252, 279, 318, 320	15
Repair	140, 165, 173, 174, 181, 183, 282	7
Replace	136, 172, 175, 178, 182, 190, 194, 195, 199, 240, 245, 247, 252, 279, 318, 320	16
Solder	156	1

REPORTING *(Category Label)* Freq. Sum = 9

Action Verbs	*Task Statement Numbers*	*Freq.*
Report	15, 34, 70, 72, 75	5
Review	27, 71	2
Submit	27	1
Update	71	1

REPRESENTATION *(Category Label)* Freq. Sum = 2

Action Verbs	*Task Statement Numbers*	*Freq.*
Represent	10	1
Serve	33	1

SAFETY *(Category Label)* Freq. Sum = 6

Action Verbs	*Task Statement Numbers*	*Freq.*
Distribute	48	1
Install	197	1
Perform	13, 132, 133, 239	4

SEAMANSHIP *(Category Label)* Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Operate	124	1

SECURITY *(Category Label)* Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Change	57	1
Destroy	180	1
Organize	23	1
Stand	332	1
Test	119	1

STAFFING *(Category Label)* Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	2	1
Initiate	8	1
Write	4	1

TRAINING ADMINISTRATION *(Category Label)* Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Approve	87, 93	2
Assign	99	1
Monitor	9	1
Prepare	77	1
Report	84, 96	2
Review	80	1
Schedule	79	1
Update	78	1

TORPEDOMAN'S MATE - TM (CONT.)

TRAINING DEVELOPMENT *(Category Label)* — Freq. Sum = 12

Action Verbs	*Task Statement Numbers*	*Freq.*
Conduct	94	1
Construct	92	1
Develop	98	1
Prepare	86, 91, 95, 97, 100	5
Update	89	1
Write	83, 85, 88	3

TROUBLESHOOTING OF ELECTRIC/ELECTRONIC EQUIPMENT *(Category Label)* — Freq. Sum = 10

Action Verbs	*Task Statement Numbers*	*Freq.*
Isolate	216, 217	2
Measure	207	1
Test	211, 222, 306, 307, 308, 309, 310	7

TROUBLESHOOTING OF WEAPON AND MISSILE SYSTEMS *(Category Label)* — Freq. Sum = 17

Action Verbs	*Task Statement Numbers*	*Freq.*
Measure	231	1
Test	263, 264, 265, 268, 270, 271, 275, 280, 281, 283, 284, 285, 286, 287, 300, 319	16

WATCH STANDING *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Stand	333, 334, 335, 336	4

WORK DETAIL OR PARTY *(Category Label)* — Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Paint	126, 323	2
Participate	322, 324	2
Preserve	126	1

CHAPLAIN SUPPORT *(Category Label)* Freq. Sum = 11

Action Verbs	*Task Statement Numbers*	*Freq.*
Arrange	490	1
Log	487	1
Maintain	488, 489, 491, 493	4
Prepare	492	1
Type	485, 486, 489, 492	4

CLERICAL FUNCTIONS *(Category Label)* Freq. Sum = 378

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	380, 381	2
Arrange	233, 234, 408, 422	4
Assign	96, 418	2
Communicate	235	1
Complete	358	1
Compute	296, 333, 334, 380, 381	5
Control	74, 364, 427	3
Coordinate	399, 422	2
Deliver	103, 139	2
Determine	66, 341	2
Distribute	102, 407, 429	3
Edit	142	1
Estimate	397	1
Follow Up	61	1
Identify	430	1
Initiate	266	1
Interpret	327, 328	2
Issue	73, 364, 387, 427	4
Log	97, 99, 100, 101, 117, 159, 245, 336, 411	9
Maintain	38, 41, 69, 86, 90, 106, 125, 137, 144, 178, 179, 180, 183, 188, 193, 195, 196, 203, 217, 233, 248, 285, 389, 416, 417, 421	26
Obtain	139, 407	2
Organize	43	1
Package/Pack	143	1

(Continued)

CLERICAL FUNCTIONS *(Category Label)* Freq. Sum = 378
(Cont.)

Action Verbs	*Task Statement Numbers*	*Freq.*
Prepare	30, 38, 65, 69, 77, 78, 90, 92, 93, 94, 98, 106, 107, 121, 122, 130, 131, 132, 137, 138, 140, 141, 148, 154, 166, 167, 177, 179, 180, 189, 192, 194, 196, 197, 198, 199, 200, 208, 211, 212, 213, 217, 225, 229, 242, 246, 248, 250, 253, 254, 256, 257, 258, 259, 260, 264, 267, 268, 269, 270, 271, 272, 273, 276, 277, 278, 279, 280, 281, 285, 286, 288, 289, 290, 292, 293, 295, 299, 305, 316, 317, 318, 320, 321, 324, 325, 326, 330, 335, 337, 338, 339, 343, 345, 346, 347, 348, 349, 350, 351, 353, 360, 361, 362, 363, 365, 366, 367, 371, 372, 373, 374, 375, 376, 377, 378, 379, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 396, 398, 401, 402, 404, 405, 406, 415, 416, 417, 424, 425, 426, 431, 432	144
Process	28, 91, 236, 403, 423	5
Proofread	142	1
Record	60, 230, 231	3
Requisition	45, 49, 322	3
Sign	53	1
Sort	102	1
Terminate	265, 291	2
Transcribe	232, 327, 328	3
Type	30, 77, 78, 94, 98, 130, 131, 132, 138, 140, 141, 145, 146, 148, 153, 154, 161, 163, 166, 171, 172, 173, 174, 175, 189, 192, 194, 197, 198, 199, 200, 204, 208, 209, 210, 211, 212, 225, 229, 241, 242, 246, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 264, 267, 268, 269, 270, 271, 272, 273, 276, 277, 278, 279, 280, 281, 286, 288, 289, 292, 293, 299, 316, 317, 318, 320, 321, 325, 326, 330, 335, 337, 343, 345, 346, 347, 348, 349, 350, 351, 353, 360, 361, 362, 365, 366, 367, 371, 372, 373, 374, 375, 376, 377, 378, 379, 382, 383, 384, 385, 386, 388, 390, 391, 392, 393, 396, 398, 401, 402, 404, 405, 415, 424, 425, 426, 431, 432	129
Update	65	1
Verify	261, 262, 296, 310, 323, 341, 358, 428	8

COMMUNICATION *(Category Label)* — Freq. Sum = 12

Action Verbs	*Task Statement Numbers*	*Freq.*
Brief	59	1
Conduct	501	1
Draft	50, 73, 133, 134, 135, 136, 168, 169, 170	9
Write	240	1

CONDUCT OF TRAINING *(Category Label)* — Freq. Sum = 6

Action Verbs	*Task Statement Numbers*	*Freq.*
Administer	303	1
Conduct	12, 16, 18	3
Disseminate	304	1
Score	302	1

CONTROLLING *(Category Label)* — Freq. Sum = 16

Action Verbs	*Task Statement Numbers*	*Freq.*
Determine	85, 329	2
Ensure	119	1
Inspect	499	1
Monitor	51, 63	2
Review	44, 64, 79, 80, 164, 329, 340, 359	8
Screen	95	1
Submit	164	1

DAMAGE CONTROL *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Maintain	498	1

DRILLS, INSPECTIONS, AND COMMAND MILITARY FUNCTIONS *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Attend	497, 503	2
Stand	502	1

GRAPHICS SUPPORT *(Category Label)* Freq. Sum = 5

Action Verbs	*Task Statement Numbers*	*Freq.*
Design	221	1
Draw	221	1
Photograph	228	1
Prepare	219, 220	2

INFORMATION RELEASE/PROMULGATION *(Category Label)* Freq. Sum = 34

Action Verbs	*Task Statement Numbers*	*Freq.*
Draft	42, 54, 82	3
Maintain	191, 202, 205, 214, 215, 218	6
Obtain	227	1
Prepare	68, 149, 150, 176, 218, 222, 223, 224, 226	9
Review	55	1
Submit	68	1
Type	147, 149, 150, 151, 152, 155, 176, 222, 223, 224, 226	11
Update	55, 190	2

INFORMATION RETRIEVAL AND DATA ANALYSIS *(Category Label)* Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Retrieve	182	1

LEADERSHIP AND SUPERVISION *(Category Label)* Freq. Sum = 14

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	57	1
Assist	297, 298, 306, 433	4
Counsel	297, 298, 306, 433	4
Ensure	36	1
Prepare	35	1
Update	39, 40	2
Write	34	1

LEGAL/DISCIPLINARY SUPPORT *(Category Label)* Freq. Sum = 79

Action Verbs	*Task Statement Numbers*	*Freq.*
Advise	450, 453	2
Assemble	463, 477	2
Authenticate	478	1
Disseminate	476, 479	2
Log	484	1
Maintain	446	1
Prepare	274, 275, 434, 436, 437, 438, 440, 442, 443, 444, 447, 451, 452, 454, 455, 456, 464, 465, 466, 474, 475, 480, 481, 482, 483	25
Process	445	1
Record	448, 457, 458, 459, 467, 468, 472, 473	8
Transcribe	472, 473	2
Type	274, 275, 434, 436, 437, 438, 440, 442, 443, 444, 447, 449, 451, 452, 454, 455, 456, 460, 461, 462, 464, 465, 466, 469, 470, 471, 474, 475, 480, 481, 482, 483	32
Verify	435, 439	2

LOGISTICS *(Category Label)* Freq. Sum = 11

Action Verbs	*Task Statement Numbers*	*Freq.*
Draft	24	1
Inventory	20, 21	2
Issue	26	1
Obtain	22, 25	2
Preserve	27	1
Requisition	19	1
Store	27	1
Turn In	23	1
Update	75	1

MAINTENANCE OF OFFICE EQUIPMENT *(Category Label)* Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Adjust	62	1
Clean	62	1
Lubricate	62	1

MEETINGS, SEMINARS, AND CONFERENCES *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Attend	500	1

ON-THE-JOB TRAINING *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Conduct	17	1

OPERATION OF DATA PROCESSING/COMPUTING EQUIPMENT *(Category Label)* — Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Insert	181	1

OPERATION OF OFFICE EQUIPMENT *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Edit	187	1
Proofread	186	1
Type	184, 185	2

ORGANIZATION *(Category Label)* — Freq. Sum = 4

Action Verbs	*Task Statement Numbers*	*Freq.*
Coordinate	32, 37, 76, 352	4

PERSONNEL SUPPORT *(Category Label)* — Freq. Sum = 27

Action Verbs	*Task Statement Numbers*	*Freq.*
Assist	319, 332, 342, 354, 355, 356, 357, 400, 412, 413, 414, 441	12
Counsel	319, 332, 342, 354, 355, 356, 357, 412, 413, 414, 441	11
Maintain	369	1
Review	368	1
Route	368	1
Terminate	370	1

PLANNING *(Category Label)* Freq. Sum = 9

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	31	1
Determine	29, 71, 72	3
Evaluate	56	1
Organize	33	1
Plan	33, 67	2
Review	47	1

REPORTING *(Category Label)* Freq. Sum = 48

Action Verbs	*Task Statement Numbers*	*Freq.*
Compile	157	1
Follow Up	207	1
Prepare	52, 70, 81, 87, 201, 206, 243, 244, 249, 282, 283, 284, 331, 344, 394, 395, 409, 410, 420	19
Type	52, 70, 81, 87, 156, 157, 158, 160, 162, 165, 206, 243, 244, 247, 249, 282, 283, 284, 331, 344, 394, 395, 409, 410, 420	25
Verify	263, 287	2

REPRESENTATION *(Category Label)* Freq. Sum = 1

Action Verbs	*Task Statement Numbers*	*Freq.*
Perform	504	1

SECURITY *(Category Label)* Freq. Sum = 22

Action Verbs	*Task Statement Numbers*	*Freq.*
Brief	115	1
Change	114	1
Destroy	108	1
Inventory	128	1
Log	110, 111, 112, 126	4
Maintain	113, 124	2
Mark	127	1
Package/Pack	123	1
Prepare	104, 105, 116, 123, 129	5
Report	109	1
Stand	507	1
Type	118, 120, 129	1

SOCIAL FUNCTIONS SUPPORT *(Category Label)* Freq. Sum = 6

Action Verbs	*Task Statement Numbers*	*Freq.*
Coordinate	237	1
Maintain	216, 239	2
Plan	237	1
Prepare	216, 238	2

STAFFING *(Category Label)* Freq. Sum = 8

Action Verbs	*Task Statement Numbers*	*Freq.*
Assign	58	1
Monitor	83, 84	2
Prepare	88, 89	2
Type	88, 89	2
Write	48	1

TRAINING ADMINISTRATION *(Category Label)* Freq. Sum = 25

Action Verbs	*Task Statement Numbers*	*Freq.*
Approve	9	1
Control	46	1
Issue	46	1
Maintain	419	1
Monitor	15	1
Prepare	1, 307, 308, 309, 311, 313, 315, 419	8
Process	314	1
Report	6	1
Requisition	294, 300, 301	3
Review	4	1
Schedule	3	1
Type	307, 311, 315	3
Update	2	1
Verify	312	1

TRAINING DEVELOPMENT *(Category Label)* — Freq. Sum = 7

Action Verbs	*Task Statement Numbers*	*Freq.*
Construct	14	1
Prepare	8, 13	2
Update	11	1
Write	5, 7, 10	3

WATCH STANDING *(Category Label)* — Freq. Sum = 24

Action Verbs	*Task Statement Numbers*	*Freq.*
Stand	505, 506, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529	24

WORK DETAIL OR PARTY *(Category Label)* — Freq. Sum = 3

Action Verbs	*Task Statement Numbers*	*Freq.*
Paint	495	1
Participate	494, 496	2

APPENDIX G

MATRIX OF JOB TITLES BY CLUSTERS FOR THE AVIATION MACHINIST'S MATE (AD) RATING

Table F-1

Matrix of Job Titles by Clusters

for the Aviation Machinist's Mate (AD) Rating

Job Title	Number of AD Cluster							
	1	2	3	4	5	6	7	8
500 Laborer	**34**	**3**	**16**	**17**		**40**	**14**	**5**
	24.3	2.1	11.4	12.1		28.6	10.0	3.6
	21.8	*10.7*	*23.5*	*9.2*		*23.1*	*22.2*	*4.5*
Plane Captain	**1**	**6**		**5**		**3**	**4**	
	.6	3.4		2.8		1.7	2.3	
	.6	*21.4*		*2.7*		*1.7*	*6.3*	
Work Center Supervisor	**13**	**1**	**4**	**43**	**18**	**11**	**1**	**2**
	10.7	.8	3.3	35.2	14.8	9.0	.8	1.6
	8.3	*3.6*	*5.9*	*23.4*	*72.0*	*6.4*	*1.6*	*1.8*
Maintenance Crewmember	**26**	**2**	**16**	**18**		**46**	**7**	**15**
	19.7	1.5	12.1	13.6		34.8	5.3	11.4
	16.7	*7.1*	*23.5*	*9.8*		*26.6*	*11.1*	*13.5*
Engine Build-Up Mechanic	**5**	**2**		**5**		**13**	**1**	**34**
	8.3	3.3		8.3		21.7	1.7	56.7
	3.2	*7.1*		*2.7*		*7.5*	*1.6*	*30.6*
Assistant Shop Supervisor	**15**		**2**	**29**	**3**	**17**	**2**	**2**
	19.7		2.6	38.2	3.9	22.4	2.6	2.6
	9.6		*2.9*	*15.8*	*12.0*	*9.8*	*3.2*	*1.8*
Power Plants Troubleshooter	**31**	**1**	**11**	**8**		**20**	**9**	**1**
	38.3	1.2	13.6	9.9		24.7	11.1	1.2
	19.9	*3.6*	*16.2*	*4.4*		*11.6*	*14.3*	*.9*
Quality Assurance Representative	**1**		**1**	**3**	**1**			
	1.8		1.8	5.4	1.8			
	.6		*1.5*	*1.6*	*4.0*			
Flight Engineer		**2**	**1**	**13**				
		4.3	2.2	28.3				
		7.1	*1.5*	*7.1*				

(Continued)

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	9	10	11	12	13	14	15	16
500 Laborer	**2** 1.4 *8.7*	**2** 1.4 *.9*						**7** 5.0 *10.8*
Plane Captain		**152** 86.4 *65.0*		**5** 2.8 *7.6*				
Work Center Supervisor	**2** 1.6 *8.7*	**1** .8 *.4*		**5** 4.1 *7.6*	**18** 14.8 *56.2*	**3** 2.5 *8.6*		
Maintenance Crewmember	**1** .8 *4.3*	**1** .8 *.4*						
Engine Build-Up Mechanic								
Assistant Shop Supervisor					**5** 6.6 *15.6*	**1** 1.3 *2.9*		
Power Plants Troubleshooter								
Quality Assurance Representative								**50** 89.3 *76.9*
Flight Engineer			**30** 65.2 *75.0*					

(Continued)

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	1	2	3	4	5	6	7	8
Maintenance Control Chief		1		3				
		1.8		5.5				
		3.6		*1.6*				
Line Supervisor				2		1		
				4.3		2.2		
				1.1		*.6*		
Complete Engine Repair (CER) Crew Leader	4				2	2		38
	8.7				4.3	4.3		82.6
	2.6				*8.0*	*1.2*		*34.2*
Turbo-Shaft Mechanic	1		11	3		8	9	6
	2.6		28.9	7.9		21.1	23.7	15.8
	.6		*16.2*	*1.6*		*4.6*	*14.3*	*5.4*
Check Crewmember	15	1	2			3	7	2
	50.0	3.3	6.7			10.0	23.3	6.7
	9.6	*3.6*	*2.9*			*1.7*	*11.1*	*1.8*
Line Crewmember				1				
				3.2				
				.5				
Training PO			1	1		2		1
			6.2	6.2		12.5		6.2
			1.5	*.5*		*1.2*		*.9*
Division Chief				2				
				8.3				
				1.1				
Aircrew Member (Fixed Wing)	2	7		5				
	7.7	26.9		19.2				
	1.3	*25.0*		*2.7*				

(Continued)

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	9	10	11	12	13	14	15	16
Maintenance Control Chief							**51** 92.7 *79.7*	
Line Supervisor		**19** 41.3 *8.1*		**23** 50.0 *34.8*		**1** 2.2 *2.9*		
Complete Engine Repair (CER) Crew Leader								
Turbo-Shaft Mechanic								
Check Crewmember								
Line Crewmember		**30** 96.8 *12.8*						
Training PO		**1** 6.2 *.4*		**5** 31.3 *7.6*		**5** 31.3 *14.3*		
Division Chief				**8** 33.3 *12.1*	**2** 8.3 *6.3*	**8** 33.3 *22.9*		**4** 16.7 *6.2*
Aircrew Member (Fixed Wing)		**4** 15.4 *1.7*	**8** 30.8 *20.0*					

(Continued)

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	1	2	3	4	5	6	7	8
Administrative PO/ CPO	**1** 9.1 *.6*			**1** 9.1 *.5*				
Test Cell Operator								
Check Crew Leader	**2** 16.7 *1.3*		**2** 16.7 *2.9*	**4** 33.3 *2.2*		**2** 16.7 *1.2*	**1** 8.3 *1.6*	**1** 8.3 *.9*
Line Troubleshooter	**3** 37.5 *1.9*						**2** 25.0 *3.2*	
Component Repair Mechanic						**3** 100.0 *1.7*		
"SAR" Crewmember		**2** 11.1 *7.1*		**3** 16.7 *1.6*			**5** 27.8 *7.9*	
Assistant Line Supervisor				**2** 13.3 *1.1*				
Branch Chief				**6** 50.0 *3.3*	**1** 8.3 *4.0*			
Leading Chief								

(Continued)

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	9	10	11	12	13	14	15	16
Administrative PO/ CPO				1 9.1 *1.5*		6 54.5 *17.1*	2 18.2 *3.1*	
Test Cell Operator	18 100.0 *78.3*							
Check Crew Leader								
Line Troubleshooter		3 37.5 *1.3*						
Component Repair Mechanic								
"SAR" Crewmember		4 22.2 *1.7*		3 16.7 *4.5*				1 5.6 *1.5*
Assistant Line Supervisor		6 40.0 *2.6*		6 40.0 *9.1*		1 6.7 *2.9*		
Branch Chief				1 8.3 *1.5*	3 25.0 *9.4*	1 8.3 *2.9*		
Leading Chief						1 100.0 *2.9*		

(Continued)

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	1	2	3	4	5	6	7	8
Aircraft Division CPO								
Aircrew Member (Rotary Wing)				**5** 41.7 *2.7*			**1** 8.3 *1.6*	
Production Control PO/CPO								
Propeller Mechanic	**2** 66.7 *1.3*		**1** 33.3 *1.5*					
Ground Support Equipment (GSE) PO								**1** 20.0 *.9*
Compartment Cleaner								
Corrosion Control PO						**1** 100.0 *.6*		
Loadmaster								
Production Control Records Keeper						**1** 100.0 *.6*		

(Continued)

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	9	10	11	12	13	14	15	16
Aircraft Division CPO				1 10.0 *1.5*	4 40.0 *12.5*	4 40.0 *11.4*		1 1.0 *1.5*
Aircrew Member (Rotary Wing)		5 41.7 *2.1*		1 8.3 *1.5*				
Production Control PO/CPO							9 90.0 *14.1*	1 10.0 *1.5*
Propeller Mechanic								
Ground Support Equipment (GSE) PO		3 60.0 *1.3*		1 20.0 *1.5*				
Compartment Cleaner		1 100.0 *.4*						
Corrosion Control PO								
Loadmaster			1 100.0 *2.5*					
Production Control Records Keeper								

(Continued)

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	1	2	3	4	5	6	7	8
Division Officer								
Operations CPO/PO								
Test Flight Crew-member				1 100.0 *.5*				
School Administrator								
Technical Advisor				1 100.0 *.5*				
Material Control Chief								
Write-In								2 50.0 *1.8*
Invalid Response				3 23.1 *1.6*				1 7.7 *.9*

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line present row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

Table F-1 (Continued)

Job Title	Number of AD Cluster							
	9	10	11	12	13	14	15	16
Division Officer						**2** 100.0 *5.7*		
Operations CPO/PO						**1** 100.0 *2.9*		
Test Flight Crew-member								
School Administrator						**1** 100.0 *2.9*		
Technical Advisor								
Material Control Chief							**1** 100.0 *1.6*	
Write-In							**1** 25.0 *1.6*	**1** 25.0 *1.5*
Invalid Response		**2** 15.4 *.8*	**1** 7.7 *2.5*	**6** 46.1 *9.1*				

Note. The top line for each job title shows the frequencies in bold font. The numbers in regular font on the second line resent row percentages for the job title subgroup across clusters. The numbers in *italic* font on the third line present column percentages for the cluster subgroup across job titles.

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